

A PROGRESSIVE COURSE
OF
Comparative Geography
ON THE CONCENTRIC SYSTEM

By P. H. L'ESTRANGE, B.A.

ASSISTANT MASTER AT MALVERN COLLEGE ; LATE EXHIBITIONER OF QUEEN'S COLLEGE, OXFORD

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Preface to the Teacher

THE Aims of this book are, in general, to stimulate the learner's reason rather than to train his memory ; to give him the power of using a few facts and principles well, rather than of merely storing in his memory a great many details, most of which are at best useless, often distinctly harmful to the growing intellect. Mastery of details is a small thing compared to the ability to understand their meaning. In a word, Education, not Instruction, is the end in view.

In particular, an attempt has been made to provide a definite course of geographical teaching for schools, so arranged that every boy in the school in which this book is adopted may be free from the danger of being taught one special part of Geography over and over again, owing to defective organisation, and at the same time not so rigid as to prevent the teacher from exercising the utmost latitude in the treatment of his subject.

To take the case of an imaginary schoolboy. He begins in the lowest class, and, as the school is divided into the three sections for geographical teaching, naturally learns only the parts of the book under the heading "A." If he is a slow learner, he will take perhaps two years to reach the middle section "B" of the school. He will during that period have gone through the "A" course once. If he then gets into the "B" section, he will go over the same ground again, but will gain additional knowledge, at the same time revising what he has before acquired, and so on in the upper or "C" section.

Every boy, who remains in the school for two years, automatically is taken through the geography of the world. If he stays four years, he will go through the course twice, if six years three times.

If it is arranged that the lower section of the school learn the "A" matter, the middle section the "A" and "B" matter, and the upper section the "A" "B" and "C" matter, and if the whole school is learning the same "Part" simultaneously, there can be no overlapping and no ill-ordered acquisition of knowledge. A Progressive and Concentric System is therefore provided.

The Methods adopted are as follows. The learner, starting with well-known everyday phenomena around

him, is led to deduce from these some guiding principle, in accordance with the theories of the best physical geographers. When the principles of geography have thus been examined, they are applied first of all to the Home Country, and then to countries which become gradually more and more unlike our own.

The First Part therefore deals with the Earth's Crust, Land Forms, Weather and Climate and Rainfall, the Seasons, and the Conditions necessary for Plant and Animal Growth. The methods of graphically showing the above are then described (Survey Maps, Map Projections, Climatic, Rainfall and Vegetation Maps, and so on). The thorough understanding of all maps, illustrations and diagrams is ensured by a complete series of questions.

The Second Part treats of the British Isles ; the Third, of Europe ; the Fourth, of North America and Asia ; the Fifth, of Central and South America and Africa ; and the Sixth, of the " British Empire " as a whole, the previously acquired knowledge being applied to the diverse units of which the Empire is composed.

In each Part the following order is adopted : (I) Position in the World, and Comparative Area ; (II) Surface Characteristics and Structure ; (III) Seasonal Temperatures and Pressures ; Winds and Rainfall ; Vegetation, Natural and Industrial ; Minerals ; Communications ; Distribution of Population ; (IV) Political Divisions and actual state of development. History explained by geographical considerations. Necessary facts—positions of places, ports, industries, and trade routes by sea, river, canal, or rail—are shown in an accompanying map, with a Test Map (printed on the back), marked with symbols instead of names. These are arranged in a rational order usually, e.g. towns are referred to as T1, T2, T3, etc., in order of population ; rivers as R1, R2, etc., in order of length, and so on.

A simple method is thus supplied of teaching the pupil "Where ?" a place is. He can usually supply the "Why there ?" from the previous pages.

It will be noticed that a logical order is followed throughout. If it is known where a country is on the globe, and how its mountains and plains are arranged, its

temperature at various seasons, its winds and rainfall can be usually deduced. From these follow its natural vegetation and products, and the pursuits of its human inhabitants and their distribution.

Again, regions of the world which have similar conditions as to position and climate are treated side by side e.g., Asia and North America; South America and Africa; Australia and British South Africa. The map projections are usually chosen in such a way that lines of latitude are straight, and correspond in both the areas shown side by side for comparison. Thus, South America and Africa are put side by side with the equator running right across the page as one straight line. Climatic comparisons thus become easy. The Regional Method is adopted as far as possible, though continents are also treated as a whole for the sake of convenience, Wall Maps and Readers being usually arranged on a Continental basis.

To carry out the above scheme it has been necessary to make a long Series of Maps (69 plates in all). Each of these deals with that aspect of the country which is required. The names in each map are printed in three different colours. The boys in block "A" learn the names in brown, those in "B" learn the blue names as well, those in "C" the names in brown, blue and red.

All Illustrations have full notes and questions below them, to bring out their meaning.

Opposite each map is a graduated list of questions, so framed that the learner is forced to find out the exact

meaning of the details in the map. The pupil is not told to read so many pages and look up the places in a map—a piece of advice seldom followed; but he is given a map, and from it he has to find out the answers to various problems.

Special Methods of Teaching.—Exercises are set which have to be done by the pupil in preparation for the lesson; these can usually be written from the maps. In class, the written work is handed in, and the lesson heard with the help of the Test Maps. Several of the exercises consist in tracing maps, so as to bring out special features; some set maps to be drawn on squared paper by means of given co-ordinates, or on ordinary paper by means of lines and angles made by a protractor.

Apparatus.—A large-sized globe, either marked physically or made with a slate surface for chalk, and a series of large physical wall maps (unnamed for preference) are almost necessities in the class-room. A supply of transparent tracing paper (8 inches by 10 is a convenient size) is also necessary. Squared paper, rulers and protractors are also needed for certain exercises.

Extra books for the pupils are not a necessity. A good reference atlas, for use in the same way as a dictionary, may be kept in the class-room or library, but is a dangerous weapon in the hands of a beginner. Good descriptive Readers can well be used in conjunction with this book, but should not be given to the pupil to work up as a set task. The reading of extracts from good geographical authorities by the teacher is of greater value in most cases.

Author's Preface

My thanks are due to Mrs. Aubrey Le Blond, Mrs. Peel, Miss Isobel McLearn, and to Dr. C. F. Grindrod, for their kind help in the illustrations, as well as to several boys of Malvern College—especially E. E. Walker and T. K. Mitchelson—for the photographs taken by them for Part I.

Of the several publications used for reference, *The Statesman's Year-Book*, *The International Geography*, "The Regions of the World" Series, (edited by H. J. May, 1906.

Mackinder), *The Atlas of Meteorology* (Bartholomew & Herbertson), *The Distribution of Rainfall over the Lands* (by A. J. Herbertson), *The Handbook of Commercial Geography* (by G. G. Chisholm), *Philips' Advanced Class Book of Modern Geography*, *The Historical Geography of Palestine* (by G. A. Smith), and *Maps, their Uses and Construction* (by G. J. Morrison), have proved of great assistance, which I here take the opportunity of acknowledging.

P. H. L'ESTRANGE.

Note to Fifth Edition

I wish to express my thanks to the many correspondents, especially to those of the University of Tasmania,


who have drawn attention to certain inaccuracies in previous editions, which have now been corrected.

P. H. L'ESTRANGE.

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The Earth's Crust—Igneous Rocks.

A Men find themselves living upon a great sphere with a surface partially dry and partially covered by great oceans. By actual measurement and calculation they find that the diameter of this sphere is about 8,000 miles, its circumference about 25,000 miles; the highest land is about $5\frac{1}{2}$ miles above sea level; the deepest ocean bed about 6 miles below it: that is, the surface of the globe is comparatively smooth, much smoother than the skin of an orange when compared to its diameter. Far down beneath the surface there must be intense heat, judging from the increase in temperature as a mine gets deeper. To account for this state of things, it is supposed that once there was in space a great mass of heated gaseous particles revolving round a centre, gradually cooling. At last a more or less solid crust was formed; the water vapour, as the surface cooled, was able to fall as rain, and fill up the hollows on the sphere, which in the cooling was naturally not absolutely smooth. Thus an arrangement of ocean and continent may have originated. The character of the rock-surface would naturally resemble the rocks formed by volcanoes in recent times. Geologists have discovered that these igneous or fire-formed rocks vary in appearance, according to the rate of cooling. Very rapidly cooled lava assumes a glassy form. If the cooling process is slower, the various constituents have a tendency to form crystals, and if the process is very slow the rocks may become entirely crystalline. The necessary conditions only exist deep beneath the surface, and of course are no longer associated with volcanic disturbances. The rocks thus formed are igneous but not volcanic igneous. The photograph of some actual rock specimens clearly shows the differences.

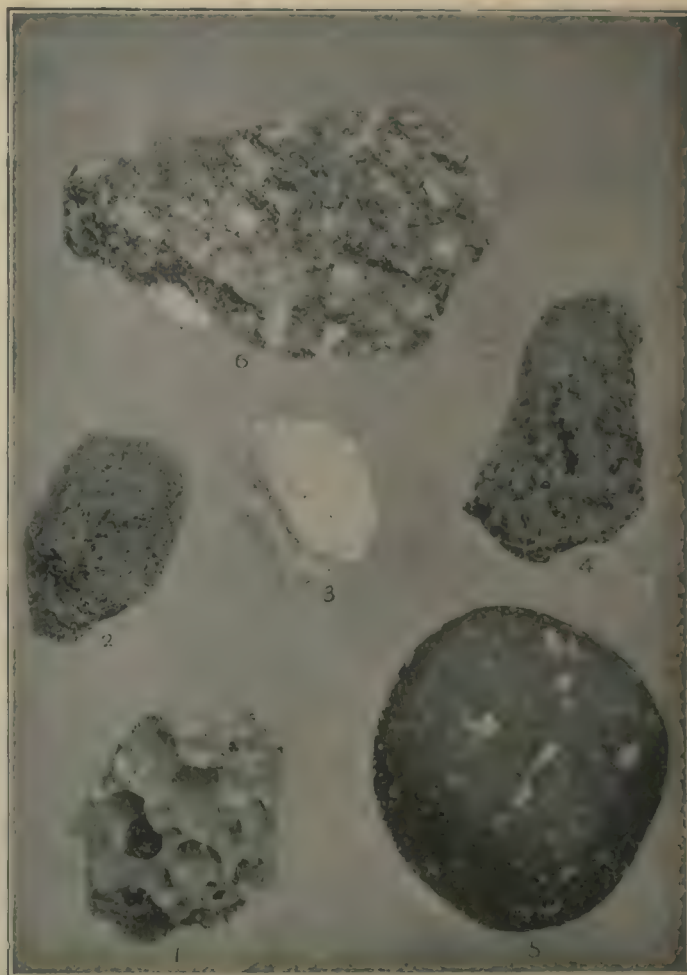


FIG. 1.

Nos. 1, 2, 3, 4 are pieces of cinders and pumice from the crater of Vesuvius. The escape of imprisoned gases accounts for the cellular nature of the rocks. There has been no time for crystallisation, owing to rapid cooling. No. 5 shows a rock which has cooled rather slowly. The black mass is somewhat like bottle glass, but many crystals have had time to form, as can easily be seen. No. 6 is an example of an entirely crystalline rock, which has cooled slowly, deep down under great pressure.

B This supposition of a gaseous nucleus is known as the Nebular Hypothesis. Various analogies can be found for it among the other bodies in space. Perhaps the ring round Saturn is a revolving mass of similarly heated particles.

Igneous or fire-formed rocks may thus be divided into Volcanic, i.e., those which have cooled more or less rapidly near the surface, and Plutonic, which have cooled slowly, usually at great depths. There is, of course, no

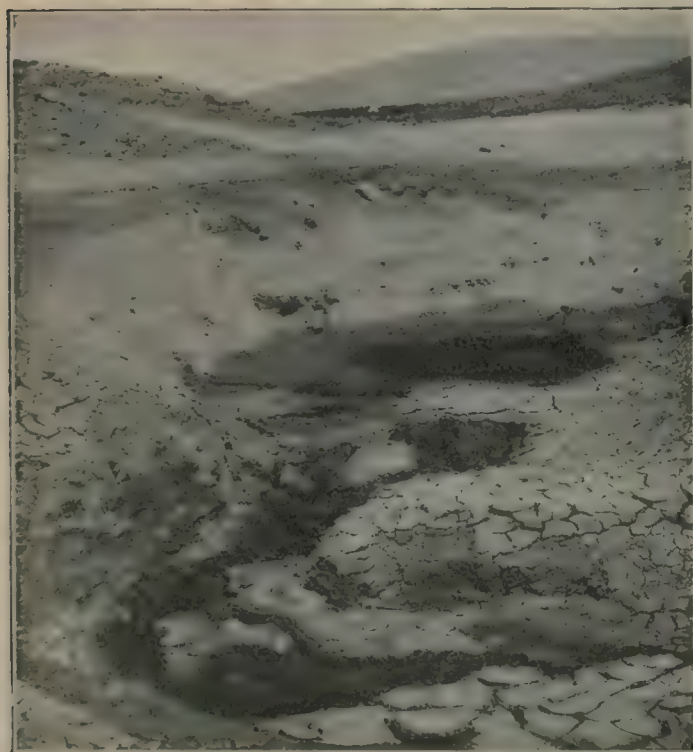


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FIG. 2.—PORTION OF THE GIANTS' CAUSEWAY.

What kind of rock is this? Explain the peculiar formation. Does the high rock at the top of the picture seem to be made of the same rock throughout?



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FIG. 3.—HOLE IN AN IRISH MOOR, WHERE A SMALL LAKE DISAPPEARS BY AN UNDERGROUND CHANNEL.

The cross marks the overflow channel. Do these cracks in the mud at all correspond with the columnar structure in the Giants' Causeway? Does the miniature gorge in the foreground resemble the cañon of the Colorado? Have similar causes been at work in all these cases?

definite division between the two classes. Great flows of lava which cover large areas have a tendency to cool down into six-sided columns. This natural result of contraction is well illustrated by the roughly six-sided marks which can often be seen on a dried mud surface.

The proportion of the earth's surface affected by volcanic disturbance is not great. The chief lines of weakness, where the cracked condition of the crust enables water to percolate down and so cause the chemical changes which result in the great volcanic explosions, are generally to be found where great heights and depths are close together; as, for example, in Japan and along the Andes. Hardly any large volcano is found far from the sea. Volcanoes are either frequently active, as Vesuvius, where the force of the imprisoned steam is not strong enough to cause great destruction, and lava flows are common; or else are apparently dormant, but sometimes, when the pent-up gases beneath have been accumulating energy for a long period, go off with appalling violence, as in the case of Mt. Pelée in Martinique. The entire top is then blown off, deadly heavy gases are emanated,



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FIG. 4.—COOLED LAVA AT THE FOOT OF VESUVIUS.

The cone is chiefly composed of volcanic ash. In certain parts lava has welled out from the crater and flowed down the mountain, and cooled in the peculiar form here seen. Would this lava be crystalline? Notice the railway going up the cone. What does this indicate as to the nature of the volcano? See view of Vesuvius from Naples on page 70.

pumice-stone, with its evidence of steam action, is scattered around, and volcanic dust covers vast areas. Lava is usually absent.



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FIG. 5.—VOLCANIC ERUPTION IN THE WEST INDIES.
MONT PELÉE.

The photograph was taken some time after the first great eruption. The whole mountain side is covered with hot volcanic ash. The dark cloud in the centre is composed of volcanic dust and ash, and various hot gases. Locate the island of Martinique, upon which Mont Pelée stands, and give its latitude (see plate 68).



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FIG. 6.—THE TOWN OF ST. PIERRE AT THE FOOT OF
MONT PELÉE.

30,000 people were killed by the deadly gas from the mountain. In the foreground can be seen the results of the heat, and wind, and showers of debris upon vegetation; in the background remains of streets and houses.

A third form of such energy is when a fissure eruption takes place. That is, the pent-up energy finds its relief not through a single crater, but along a crack in the surface.

Great tracts of land are then covered with lava which has welled up slowly from beneath. The results upon the landscape are remarkable (see Fig. 2).

The effects of previous volcanic energy are well shown by the resultant rocks. The ashes become consolidated into coarse gritty rocks called tuff. The pumice-stone, after long floating on the ocean, at length sinks and forms a peculiar ocean deposit, which after millions of years may become a land surface. The great lava flows form columnar basalts; the smaller volcanic flows and dykes often stand up as great ridges and cliffs, while the softer materials around them have been removed by denudation.



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FIG. 7.—IGNEOUS DYKE ON THE COAST OF ANTRIM.

A hard band of igneous rock has penetrated the sedimentary beds, and being harder has better withstood the action of the waves, and so stands out like a natural breakwater.

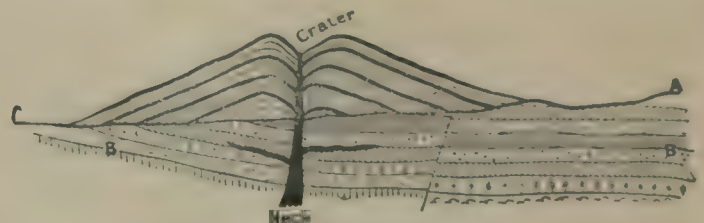
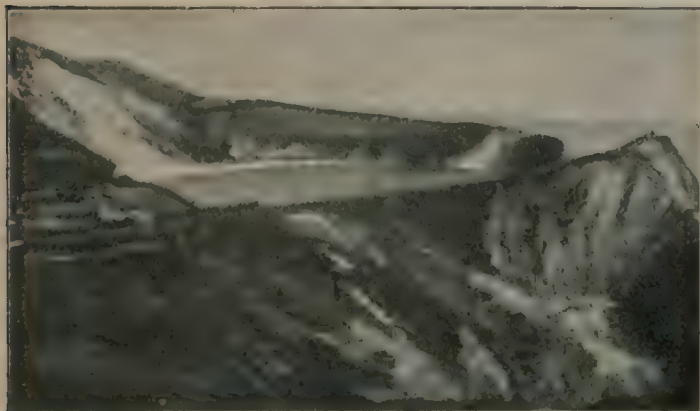


FIG. 8.—SECTION OF A VOLCANO.

AA = Old Land Surface. BB = Sedimentary Rocks. The dark lines in the cone represent lava flows. Of what materials would the cone above the line AA be composed? Can you see a "fault"? Do you notice any attempts of the molten material from the Neck to escape otherwise than by the main Crater

Sedimentary Rocks—Land Forms.

A But what would have happened to all the rock waste? A muddy stream in a gutter, a yellow river in flood, are found to be carrying away numberless particles on their downward course to the sea. In rapid mountain streams it is often possible after heavy rains to hear great boulders rolling along their rocky beds. In these grinding mills the softer parts of the rocks are reduced to fine powder, the harder parts become sand more or less coarse according to circumstances. Where the river meets the comparatively motionless mass of sea water, the heavier particles sink almost at once and help to form the sand of the shore, while the lighter ones are carried farther out to sea. Actual experiment, by dredging, shows that the sand of the sea-bed gets finer and finer as the coast is left behind. The sediment in seas or lakes would thus have been finely graded and sorted. In course of time these deposits would have become thicker and thicker: the weight above them gradually making them more and more solid, until at length they would have been transformed into hard rocks. Hence, then, the bedded clays and sandstones of the earth's surface can be accounted for. But how can these be brought above the water-surface? The gradual cooling of the earth, and the contraction caused by it, would naturally have made the outside crust too large for the part enclosed; and a slow readjustment must have become necessary. Sometimes it would have cracked, sometimes have crumpled, sometimes have sunk, sometimes have risen. Such a process may have been very gradual (it is going on still); but at any rate it can be made to explain the fact that sea-shells are found in the rocks high up among the Himalayas, that mountains often show extraordinary evidence of crumpling, that old forests are found beneath the sea, that raised sea beaches are common high above the present tide-mark, that rocks whose beds must have been once horizontal, are often to be seen with their strata tilted at great angles or even perpendicular.



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FIG. 9.—TWISTED STRATA IN SOUTH DORSET.

On the right of the picture can be seen a hard layer of Jurassic rock, much contorted by earth-folds. This has been pierced by the sea. The bay has been eaten out of the much softer Wealden rocks. The steep cliff to the left is of very hard chalk, which offers a good deal more resistance to the influence of weather and sea.

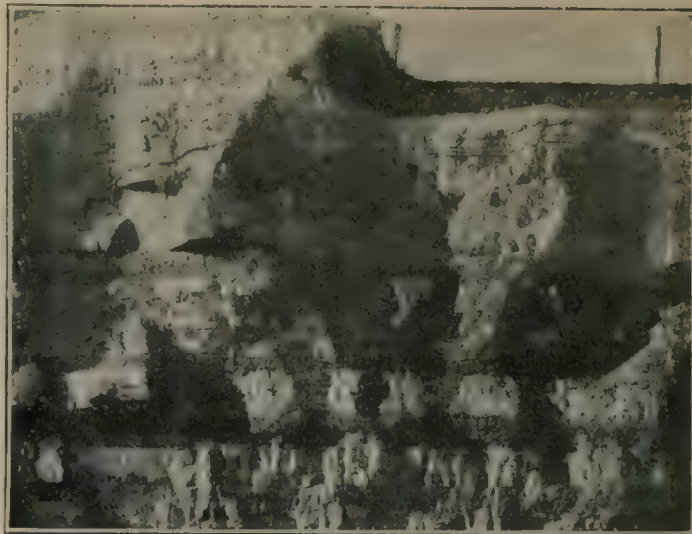
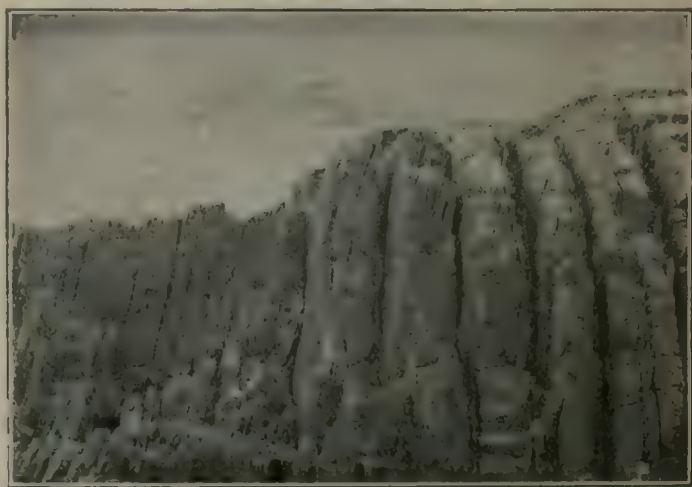


FIG. 10.—HORIZONTAL UNDISTURBED BEDS IN A SANDSTONE QUARRY. The rock is laid down in alternate layers of red and grey. Which of these is obviously the hardest? Is this a deep-water deposit or not? Why is the rock cracked near the top? For what purpose has this quarry been made?



FIG. 11.—TILTED STRATA IN A SHALE ROCK.

At about what angle do the beds lie? The photographer was facing north, the beds are facing west; was the photograph taken in the morning or afternoon?



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FIG. 12.—VERTICAL ARRANGEMENT OF ROCK-LAYERS IN SEDIMENTARY ROCK. Why is the rock to the left more worn away than that on the right? Account for the cavities which look like fissures.



FIG. 13.—QUARRY IN IGNEOUS ROCK.

Contrast this with the sandstone quarry above (Fig. 10).

B Nearly all rocks then that have not been formed by fire have been laid down by water action. As a rule they are the result of a settling process in sea or lake, and are called Aqueous or Sedimentary, as opposed to Igneous rocks. It is obvious that these aqueous deposits can be of various kinds; most are the result of the mechanical carrying away by water or wind of detached particles of the surface—sandstones for instance. Some are the result of a chemical action upon water, which causes it to deposit some of the matter in solution: magnesian limestone is a well-known example. Others are the result of deposits left by animal or plant organisms. Millions of minute creatures, living in the ocean, leave behind them tiny skeletons of lime or silica, which sink to the bottom and form beds of chalk and flint; the coral polyp is responsible for much of our limestone and marble; remains of great forests growing in tropical deltas have been transformed into beds of coal and carboniferous shale. The formation of peat at the present day offers an instance of such a process at work. We can thus get a tabular statement of various kinds of rocks met with.

IGNEOUS.
Volcanic (as Basalt).
Plutonic (as Granite).

SEDIMENTARY (or AQUEOUS).
Mechanical (as Sandstone).
Organic (as Coral Limestone).
Chemical (as Rock-salt).

When the earth crust is folded, the upper portions of the arched upfolds, called the anticlines, often have a tendency to crack and decompose, while the depressions or synclines get hardened by compression, and after long

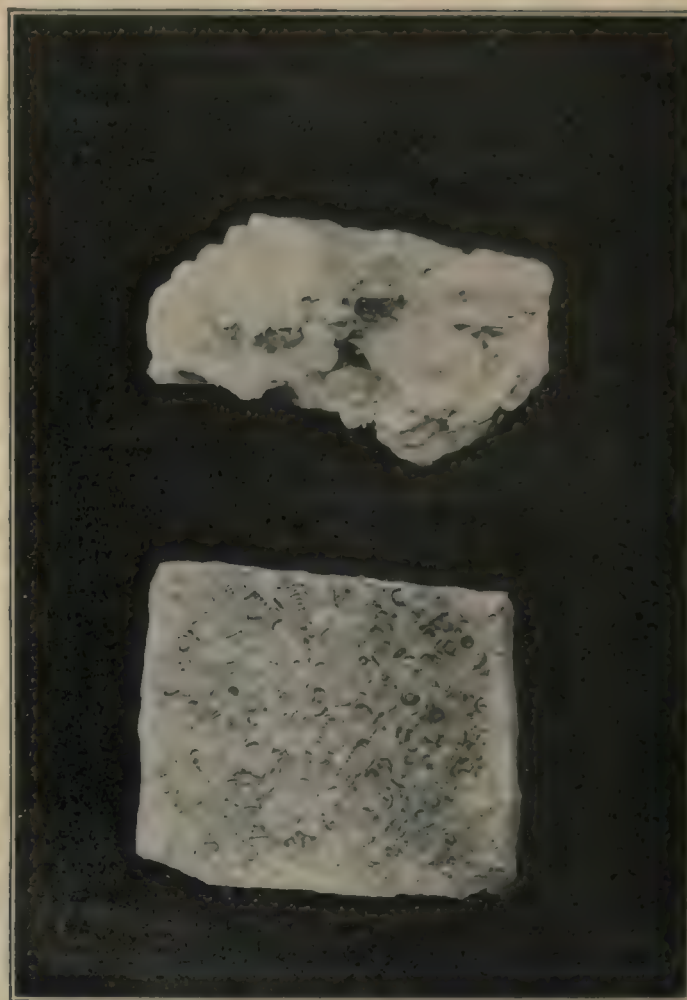


FIG. 14.—CRYSTALLINE AND SEDIMENTARY ROCKS.

The upper specimen shows a piece of crystalline rock, which has formed in a cavity, where each kind of crystal has had room to take its natural shape. These are either cubic, or six-sided, or in flakes. The lower specimen is a piece of sandstone which has evidently been formed in the sea. The fossil remains of shells represent the life of the period. They are in their natural positions.

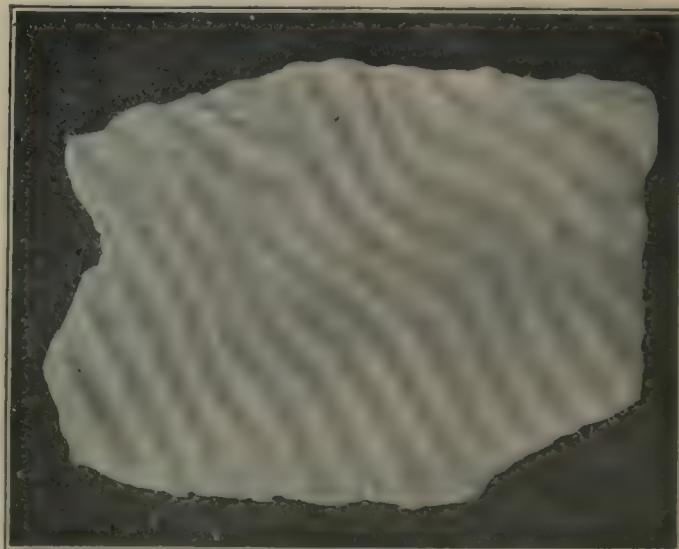


FIG. 15.—SANDSTONE—TIDE MARKED.

As the sand gradually dries, after the tide has retreated, it often takes a corrugated form. The above photograph is of a piece of sandstone, obviously laid down on a seashore. It has preserved exactly the marks which are so characteristic of similar places.

denudation (i.e. wearing away) often form the highest peaks, the Matterhorn being a well-known example.

In the diagram of an imaginary section of a mountainous country, the lighter lines show the directions

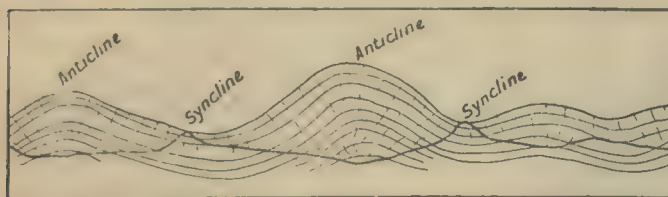
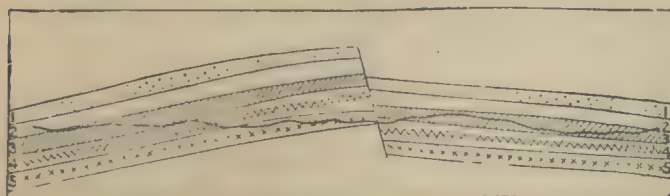


FIG. 10.—FOLD MOUNTAINS.

of the cracking and the position of the beds: the dark line the actual contour of the country, as the result of long denudation. Sometimes the great stress upon the rock-beds may cause fracture and slipping as in the second diagram.



The actual surface of the ground may show no sign of what has occurred beneath. A careful examination of the rock-beds would reveal that at the point of fracture the beds do not correspond: and here the geological surveyor would discover the "*Fault*."

Sometimes the upstanding edge remains in the landscape, often the scratched surface, caused by the slipping, may be seen, as below.



FIG. 11.—SURFACE OF IGNEOUS ROCK SCRATCHED BY "FAULTING."

This is on the line of a great "fault" which runs from the Bristol Channel to the mouth of the Dee. The rock which has slipped downwards is a red-sandstone. Pieces of this have been left sticking to the face of the igneous rock, at the places where the surface looks rough (marked by crosses). Much crushing has taken place along the line of fracture.

Though it is usually possible to identify roughly at sight in what class any given rock may be placed, sometimes great doubts arise. The gradual change from true Volcanic rocks to Plutonic obviously causes difficulties. By careful microscopic investigation of rock slices, the amount and kind of crystallisation can be determined; and as each mineral has its peculiar kind of crystal or colour or refraction, a correct analysis can often be made.

In most sedimentary rocks remains of organisms can be found: some are the same as plants or animals of the present day; some differ slightly from living species; some are entirely different, and represent a more rudimentary form of life. By careful comparison of fossil specimens, it has been possible to determine to what age of the earth's history various rocks belong. The gradual evolution of the different forms of animal and plant life can thus be traced far back, for millions of years.

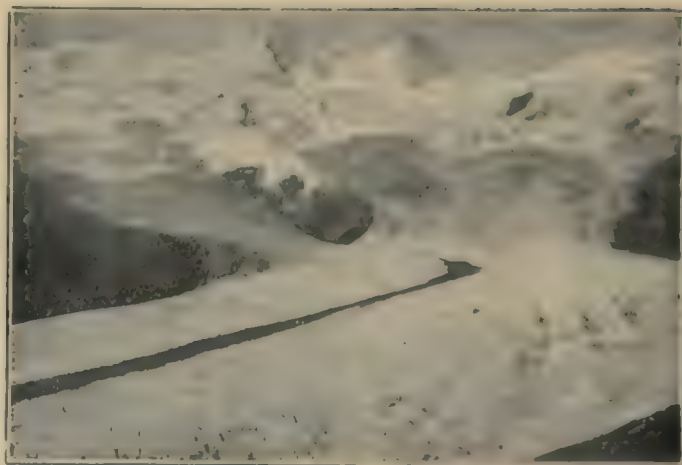
As the results of such "Stratigraphical" geology, the rocks have been divided into these great systems, the oldest being at the bottom.

EXPLANATION OF TERMS.	SYSTEMS.	INSTANCES AND NOTES.
The fourth, reckoning from Archæan.	QUATERNARY.	Dungeness and the Fens; quite recent.
The third, reckoning from Archæan.	TERTIARY.	The London and Hampshire basins.
Middle Life.	MESOZOIC.	
Chalky.	Cretaceous.	The chalk of the Downs; and the Weald of Sussex.
As found in Jura Mountains.	Jurassic.	Well seen at Weymouth, the Cotswolds, and Whitby. Birds first found.
Found in three divisions in Germany.	Triassic, or New Red Sandstone.	The great central plain of England. . . The first mammals.
Old Life.	PALÆOZOIC.	
Named from Perm, in Russia.	Permian.	Often a red pudding-stone. The Magnesian Limestone of Yorkshire.
Coal-bearing.	Carboniferous.	All the great coalfields.
	Old Red Sandstone or Devonian.	Herefordshire and Devon.
From the name of an Ancient British tribe on Welsh borders.	Silurian.	In Shropshire and Mid-Wales. The first fish.
Chiefly found in Wales.	Cambrian.	In North-West Wales.
Ancient (before life began).	ARCHÆAN.	In the Scottish Highlands.

The oldest rock is generally the hardest; but fairly recent limestones and grits are often of great hardness. The Tertiary rocks are generally sandy or of clay, and are seldom hard enough for building purposes. The ancient rocks are often more denuded or crumpled and give rise to rugged scenery (as in Wales, the Lake District and Scotland), the more recent are usually less disturbed and more suitable for agriculture, as in the Eastern Counties.

Denudation, Erosion, Ice Action.

A Rain falling upon the dry igneous surfaces would form streams or collect in hollows and make lakes; in most cases such lakes would overflow and send out a fresh river towards the sea. Those which, owing to evaporation, were unable to overflow their basins, would gradually have collected salts washed down by the feeding streams, and have become salt lakes; the others would have remained fresh and sent on the salts in solution to the ocean, which in process of time would have become more and more saline. In some parts of the world snow and ice would have taken the place of rain. Wherever the snow-fall was too great for the sun to melt in the course of the year, great accumulations would have gradually been piled up. The result of such conditions can be well seen in Greenland, where the snows of hundreds of years become solidified by their own weight and cover the land with several hundred feet of ice. This great ice cap, however, is gradually slipping

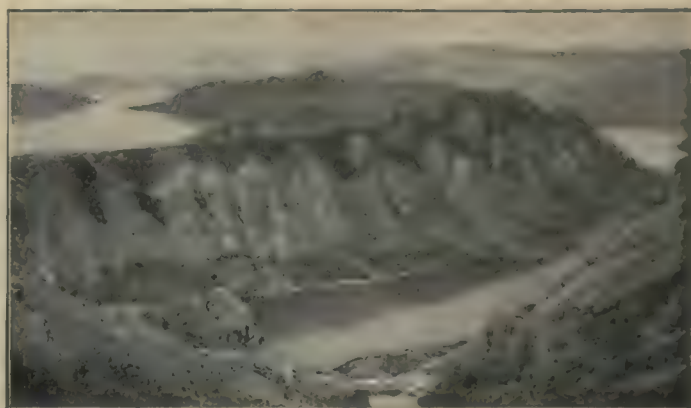


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[Mrs. A. Le Bon.

FIG. 20.—SWISS GLACIER.

Notice the snow-field above, the collecting ground for the glacier. The curved cracks in the ice surface indicate its motion. What is the cause of the black line of stones down the middle?



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FIG. 21.—A SUBMERGED VALLEY.

What results of stream-action do you see? Do you see any signs of cultivation? Why is there a green strip near the water? Do you see anything like a delta? This inlet is marked on plate 32, near Cetinje, give the approximate latitude.



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FIG. 22.—COAST LINE BEING EATEN INTO BY THE SEA, OFF LANCASHIRE.

Notice the uneven bedding of the fallen piece in the foreground. These sands and gravels were originally laid down by a glacier; they then became hardened, and are now once more in process of disintegration.



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FIG. 19.—ICEBERGS OFF BAFFIN LAND.

Notice the difference between the floe-ice, formed in the surface of the sea, which does not as a rule get more than 15 feet thick, and the great floating iceberg, which has been formed on land, a broken-off portion of an ice-cap. Ice is only slightly lighter than water. Would you expect more of the iceberg to be submerged than the visible portion? Notice the typical wooden whaling ships, rigged for sailing, with auxiliary steam power. It was in a vessel constructed somewhat after this manner that Captain Scott sailed to the Antarctic (see map at end of this part).

down on all sides towards the sea, where it breaks off into large icebergs.

The results of this action on the rocks beneath can be well seen near the edges of the smaller glaciers of the Alps.

Their surfaces become rounded and scratched: great valleys are excavated, and piles of transported stones are left behind where the ice stream melts. Most of the earth's surface, however, has been exposed to the action of rain and flowing water. In the course of millions of years huge valleys would thus have been formed, and the whole surface altered in a remarkable degree. The waves dashing against the shores would also have begun that work of destruction which is so apparent upon the coasts of to-day.

The land surface would also have been liable to the attacks of frost and wind. Frozen water in cracks often levers off huge slabs of rock. Its power is manifested by the bursting of pipes in winter time. After a thaw all steep earth banks can be seen to have lost much of their exposed surface. Blown sand also has an extraordinary power of cutting away rocks, as can be noticed wherever such surfaces are exposed in desert countries. This power is used for "frosting" the surface of glass, by causing a sand blast to be driven against it with high velocity.

The result of all these attacks, combined with the chemical action of rain water, would gradually have made a broken-up rock surface suitable for the growth of plants. These, in turn, would have pushed their roots into the cracks, have died and formed vegetable mould. Earthworms and other creatures would have continued the work of fertilizing the surface. Such a process can often be well seen in railway cuttings or quarries, where rock gradually becomes soil.

The extraordinary power of streams and rivers in



FIG. 23.—FORMATION OF SOIL FROM ROCK.

What process is here going on? Does the soil generally correspond in colour to the underlying rock? Is this a sedimentary or igneous rock? This is in an inland quarry. Does the system of cracking suggest how caves are made by the sea?

cutting away rocks by means of the sharp particles held in suspension, can easily be seen by any observer in a rainy country. On a flat surface the streams begin by cutting deep perpendicular-sided ravines, often of a won-



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FIG. 24.—GRAND CAÑON OF COLORADO RIVER.

[Photolith Co., Ltd.]

Horizontal beds of rock being gradually denuded into valleys. Can you trace the harder bands of rock?

derful depth, as in the cañons of Colorado (6,000 feet deep). The sides gradually fall in and the valley becomes more and more open, and, so long as the fall in the river-course is sufficient to enable the current to carry away the waste material, this process goes on. At last a point is reached where the process almost ceases, and the river is said to be graded: it is then generally navigable. As a rule, however, it happens that the head waters of a stream remain active, and are continually eating their way backward into the mountains. Any hard bed of rock retards the grading process and causes a waterfall. While in flood a river can often carry huge masses of



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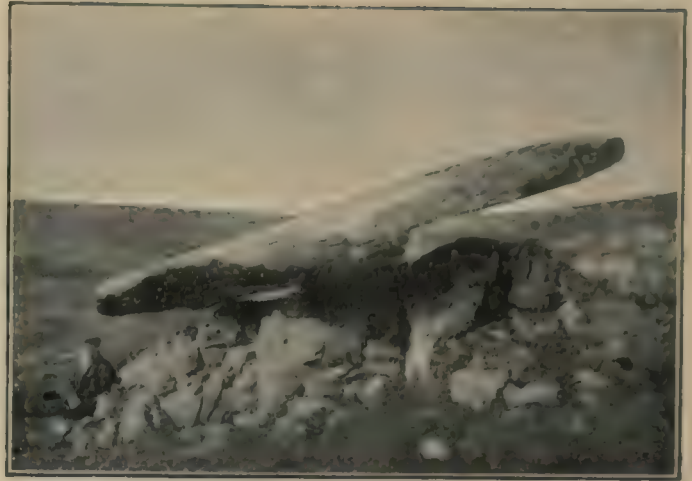
[Photochrom Co., Ltd.

FIG. 25.—A YORKSHIRE WATERFALL.

The upper layers of rock are harder than the lower ones. The latter get worn away gradually and hence an overhanging wall is formed. Here the stream is slowly eating its way back. A common type of fall.

material in suspension, but as it subsides much of this matter is deposited along its banks, and forms the flat rich meadows so common along the lower reaches of rivers. By a similar process deltas are built out to sea.

B A great ice-sheet once extended over the northern half of North America and Europe. In England it came about as far south as Birmingham, and evidences of its course can be seen in many places. Great pieces of rock, called Erratic Blocks, are often found far from their parent rocks and must have been transported by moving ice: moraines and scratched rocks are common in Wales and Scotland. Many of the fiords so common on the west coasts of all continents between Lat. 40° and



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[H. H. S. Co., London.]

FIG. 26.—"ERRATIC BLOCK."

The big slab of detached rock is obviously different from its support. How could you account for its position? The limestone upon which it rests is peculiarly liable to solution by rain-water. Does this account for the fact that the limestone beneath the slab is higher than its immediate surroundings?

60°, where the snow-fall would be heavy during an ice age, have been land valleys, probably scooped out by huge glaciers and then submerged beneath the sea. The bars of rock across their mouths and their greater depth inside seem to make it impossible that they should be merely submerged river valleys.

In glaciers which terminate on the land, such as those

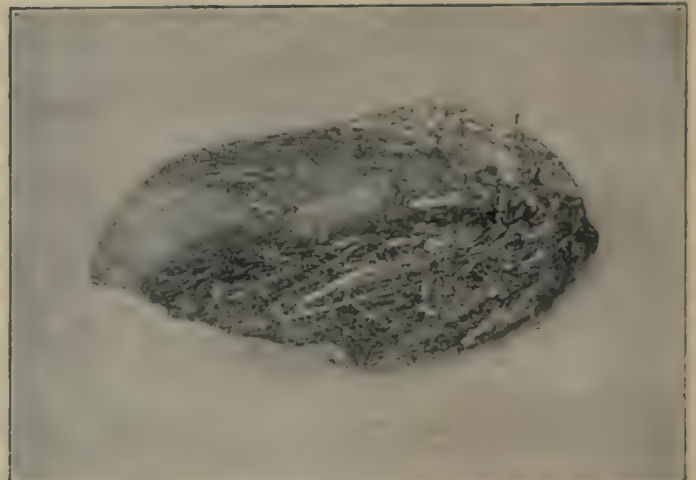


FIG. 27.—STONE FROM A MORaine IN SWITZERLAND.

This is a rather soft piece of limestone. It originally fell from a point high up on a mountain on to a glacier, found its way into a crack, and was pushed along a bed of hard igneous rock by the slowly moving ice. Are there any peculiar marks upon the stone to indicate its history? How does this stone differ from an ordinary water-worn pebble? Would you expect all the stones in a moraine to be thus marked? If you found a stone, similar to this, in its natural position among a heap of stones, would you be satisfied that the country had once been glaciated?

in the Alps, the great heaps of débris at their base are called terminal moraines, the lines of stones at their sides lateral moraines, those caused by two converging glaciers medial moraines. The photograph of the Swiss glacier (page 7) indicates clearly their origin.

The French rivers may be quoted as being well graded. The Nile has almost reached that condition; a few rock-ridges, forming cataracts, are still holding out. Such

ivers often have deltas at their mouths, or at any rate have a tendency to silt up, owing to their slow currents. The formation of deltas is due to the river sediment meeting the comparatively motionless sea water, and by falling to the bottom making a bar, which at length forms an island and divides the river into two. A repetition of this process soon multiplies the mouths. The Mississippi is thus building new land out to sea at a fast rate. In tropical countries the rapid growth of vegetation assists this operation. The mangrove swamps at the Niger mouth show the process at work.



FIG. 28.—MISSISSIPPI DELTA.

Where would the coast-line have been before the river began to build out to sea? Would you expect it to be easy for a ship to ascend the river from the sea? Account for the position of New Orleans. Is there any town on the Nile in a similar position?

C Possibly the remarkable rock basins of Finland (see Plate 21) and the great lakes of North America owe their origin to the scooping power of great ice masses. Otherwise it is difficult to account

for their peculiarities. In Ireland a great ridge of stones may be traced across the central plain, and is very probably a great moraine left behind by the retreating ice-sheet.

When rivers have reached a stage at which they deposit material in their flood-plain, it may be noticed that their course is winding. The tendency of the current is always to eat away the bank on the outside of a curve, while the slack water on the inside of each bend enables materials to settle, and often little beaches are there found. The result is that the curves are always becoming more and more tortuous, until at length the narrow neck of land is eaten through, and the river resumes for a time a straight course.

At *A* in the diagram such a case of a pinched-out bend is shown. The resulting backwater or lake is often called

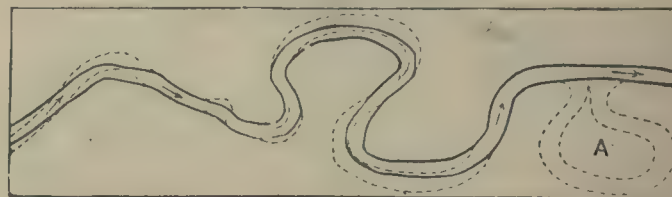


FIG. 29. RIVER BENDS.

an ox-bow. In many level fields near a river such curves can be traced, though in most cases they have been partially filled up and converted into meadow.

The river thus has a tendency to swing from side to side of its flood-plain, and when at the limit to gnaw at the barriers and gradually extend its field of energy. A subsiding flooded river naturally drops more material near its true bed, and thus often builds up banks on either side, and actually flows above the level of the surrounding country. Large rivers in this condition, such as the Mississippi and the Hwang-ho, often break their banks, form new channels and devastate the surrounding country.

QUESTIONS AND EXERCISES ON THE FIRST TEN PAGES.

A 1. Give roughly the dimensions of the globe, and the difference in level between the highest mountain and the deepest ocean. How many times greater is the earth's diameter than the height of the highest mountain above sea level?

2. How could you distinguish the various kinds of igneous rocks by their appearance? Would you expect volcanic rocks to resemble the "slag" from furnaces, which is often to be found as ballast on railways?

3. Explain how sedimentary rocks have been formed. How could you distinguish them from igneous rocks by their appearance?

4. What proofs could you bring forward of the alteration in level and position of sedimentary rocks? How do you account for these changes?

5. Distinguish between floe-ice and icebergs. What makes the ice in glaciers move? What proofs are there of this movement?

B 1. Explain what is meant by lava and basalt. Give well-known instances of the occurrence of these rocks. Account for their peculiar structures.

2. Would you expect to find lava near Mount Pelée as the

result of the last great eruption? What caused the death of the people in St. Pierre? Can you think of any other famous volcanic eruptions?

3. Divide igneous rocks into two classes, and sedimentary into three. Explain exactly the differences between each class.

4. Explain the meaning of "Earth-folds," "Synclines and Anticlines," "Faults," "Tide-marked Sandstone," "Aqueous Rocks," "Moraines," "Marine Denudation," and "Deltas."

5. Make an enlarged copy of the Nile delta from the inset Map on Plate 54; account for the position of Cairo and of the Barrage?

C 1. Draw from memory a section of a volcano, showing lava flows, the crater, the neck, and the old land surface.

2. Explain the origin of "tuff" and pumice-stone. Why does the latter at first float and then sink?

3. Write a table in order of the chief geological systems of sedimentary rocks, with their most important sub-divisions. Give explanations of the meanings of the terms used.

4. What geological formation would probably give rise to (a) Fine domestic buildings, (b) Manufacturing cities, (c) Good roads?

5. Explain exactly the causes of the bends of a river in its flood plain. Mention three well-known rivers which exemplify this tendency.

The Oceans.

Comparative Depths and Areas.

A Comparatively recent research has enabled maps of the ocean beds to be constructed with fair accuracy for most of their area. A glance at Plate 1 will show how their deepest parts are frequently near land, whilst shallow ridges often occur in mid-ocean. The change of oceanic levels is not so abrupt as on land, and their floors consist of gentle undulations, except where some volcanic agency has been at work.

The extent of the sea and its deepest parts are easily compared with land areas and heights by means of the diagrams below the map.

Kinds of Islands.

It will be noticed that the distribution of islands in the oceans is very uneven. While the North Atlantic is open in its middle portion, the Pacific is studded with hundreds of points of land. Western Europe and the north coast of North America are rich in islands, while Africa and most of South America are without them. Some islands rise from shallow waters, off great continents, and by geological and other indications are obviously remains of a former extension of continental areas.

Others are surrounded by deep sea, and have no rocks similar to the sedimentary strata of continents, and generally have animals and plants peculiar to themselves. They are either volcanic, as the Fiji Group, or are due to the work of coral-forming organisms. These flourish only in clear warm seas, and their rock is brought to the surface by upheaval of the ocean-bed or by the piling up of fragments by the waves.

Islands can then be conveniently divided into continental and oceanic types. It can be seen at once, from the map, that a comparatively small portion of the ocean-bed is below 16,000 feet, say the height of Mt. Blanc; that a vast area is between 16,000 and 7,000, in fact, more than half of the entire globe, that round all large land areas there is a shallow portion of the sea-bed, less than 600 feet deep, after which there is a rather steep descent to the 7,000-foot line. This shallow part is called often the continental shelf, and includes almost all continental islands. It is of great use in navigation, as when a ship is nearing land she can generally get easy soundings by means of a hand-line and lead. If the depth is more than 600 feet, comparative safety is assured in a storm.

Past Conditions.

B From geological evidence it is certain that the arrangement of land and water has often been very different from what it now is: most of the rocks on the earth's land surface are of marine origin, and must have been formed beneath salt water. In comparatively recent times (of course, not in historical times) the Strait of Gibraltar was closed and the Mediterranean joined to the Red Sea; the British Isles were part of the European continent; the Black and Caspian seas were united and formed a portion of a great ocean that extended east of the Ural Mountains to the Arctic. Most definite changes, such as these, however, are generally associated with continental areas, and there are reasons for supposing that the great oceans have roughly occupied their present position ever since the dawn of the geological record.

Present Conditions.

What concerns us more closely is the present condition of the oceans, the causes of their circulation and surface-currents, and their influence upon climate and civilisation. (See page 18.)

Changes of Sea Level.

C When a statement is made that in any given place the coast must have risen owing to such evidence as that of a raised beach, it must be understood that such phenomena can be equally well explained by the theory of a subsidence of ocean level; the comparative results are the same, but it is quite possible that all tablelands and fold-mountains are not upraised but are left behind by subsidences of surrounding areas, owing to earth-contraction. The whole question resolves itself into the actual perpendicular distance of any surface from the earth's centre at any given time. If "up" and "down" are used simply in their comparative sense for any given area, the actual question of upheaval or subsidence may be neglected.

Temperature and Saltness.

In general the oceans may be taken to consist of a vast body of cold water, whose average temperature of about 33° is quite independent of latitude: its surface layers vary from 90° down to below freezing point. The difference in temperature of the surface between winter and summer in any given spot is never more than about 50°, far less than in the centres of continents. As a rule, the annual range is far less; the extremes occur only when there are alternating cold and warm currents as off the coasts of Newfoundland or Japan. After about 600 feet in depth there is usually no seasonal change in the temperature of sea water.

The various parts of the ocean are by no means of the same saltness, especially as regards the surface layers. Where there is heavy rainfall, or where many rivers flow in, the superficial area of the sea becomes noticeably fresher, as in the Baltic and Black seas. Melting icebergs have the same effect upon the ocean off Greenland or the Antarctic continent. The Mediterranean and Red seas, on the other hand, lose more by evaporation than they receive from rivers and rainfall, and are saltier than the average. Into them a constant current flows from outside to make up the deficit.

Ocean Deposits.

The character of the various deposits on the ocean floor has of late years received much attention, and interesting results have been obtained.

Within a distance of land up to 300 miles, there is generally a considerable growth of terrigenous (i.e. derived from land) deposit, consisting of materials derived from the shore.

Beyond this limit Pelagic (or deep sea) deposits begin. These consist chiefly of lime formed from the shells of minute organisms which live upon the surface. In very deep parts, the lime becomes dissolved before reaching the bottom, and a deposit of Red Clay is found, consisting largely of dust derived from volcanoes and meteorites. In the colder parts of the oceans siliceous or flinty deposits take the place of lime; they are derived in like manner from the remains of minute organisms

Notes and Questions on Physical Maps.

A The two following maps are drawn on similar projections and on the same scale, but different centres have been taken, in order to correct the distortion necessary in this method of map-drawing, and also to show the true relations of the Pacific Ocean.

The physical colouring on the named map shows clearly the results attained by ocean soundings, and brings out the general arrangement of mountain and plain on the land. Some of the chief alluvial valleys have been picked out by the letter (A) after them. These consist of flat plains of rich soil deposited by great rivers in their lower courses. The most important mountain systems have been named. A tableland implies a lofty area consisting of rocks with horizontal bedding, not disturbed by earth-folding.

Plateau is applied rather vaguely to elevated regions where the rock-bedding is not necessarily so regular. (F) after a name implies that the mountains are the result of the crumpling of the earth's crust owing to side pressure caused by shrinking. (F=folded.)

The sections above the maps should be carefully compared with the maps themselves. Each given latitude should be followed, and the actual height or depth of the section compared with the colouring of the map.

B In the east of equatorial Africa the words "Rifted Tableland" refer to the remarkable series of rift valleys which are there found. They are really caused by two parallel faults in the surface. The region between has sunk, or the two regions on either side have been lifted. The result is long lines of depression. The long narrow lakes there found occupy parts of these curious troughs. The Red Sea fills another, the Jordan flows along its northerly extension.

The name Great Southern Ocean is here applied to the part of the sea which lies between Lat. 40° and the Antarctic Circle. The sea area south of the Antarctic Circle is usually called the Antarctic Ocean. This is very limited in size compared to the other great bodies of water, and has been left unnamed.

For the arrangement of sea and land round the Poles, see Plate 6.

QUESTIONS AND EXERCISES. (From the named map.)

- A** 1. Write a list, from the map, of the mountain ranges, plateaus, tablelands, plains, and alluvial valleys, in the various continents.
2. At what heights on sea and land are the various contours shown by change of tint?
3. Calculate, by counting the squares in the middle diagram below the map, the number of square miles on the globe, and the proportionate areas of land and sea.
4. Which continent has the greatest area above 12,000 feet, below 600 feet? Which has the smallest area below 600 feet?

5. Write down the great mountain systems mentioned in the map; also the plains, tablelands, and ice-sheets.

6. Round the margin of which ocean should you say there is a ring of volcanic rocks? Can you account for this?

7. What oceans are cut by the meridian of Greenwich? what by the tropic of Capricorn?

8. Write down, in order of their highest peak, the names of the continents, giving the actual height in each case to the nearest thousand feet.

9. Is there more land north of the equator than south of it? east of Greenwich than west?

B 1. Taking the equator as 25,000 miles, calculate how many miles there are in a degree of longitude at the equator. It is about $9\frac{1}{2}$ inches long in the map. How many miles go to the inch?

2. Where there is a sudden change from high mountains to deep ocean, volcanic energy is likely to be great. Earthquakes generally are caused by similar conditions. Would you expect earthquakes to be common in England, Japan, the Andes, Hudson Bay, Russia?

3. Compare Lat. 60° S. with Lat. 60° N. as to the proportionate amount of sea and land through which they pass.

C 1. Account for the shallow ocean off the mouth of the Amazon, and for the lack of volcanic energy in Africa.

2. Is it true to say that more than half of the ocean area on the globe is more than 12,000 feet deep? or that most of the land surface is over 6,000 feet?

3. Give some examples of Continental Islands, and of the two kinds of Oceanic Islands.

QUESTIONS AND EXERCISES.

(To be said or written from the Test Map only.)

- A** 10. Name the continents and oceans by their symbols.
11. Name the continents in order according to the elevation of their highest peak.
12. Why do the outlines of the continents differ in shape in these two maps?
13. What oceans and continents are crossed by Lat. 50° N. the Equator, Lat. 40° S., Lat. 60° S., by Long. 30° W. and 140° E.?
14. If this map is $9\frac{1}{2}$ inches from east to west, how many miles per inch are there, measured along the equator?
15. How many thousand feet is the highest mountain above sea level and the lowest ocean abyss below it?
16. Which is the largest ocean? Has this ocean many islands? How are they formed?
17. Is there much sea south of the Antarctic Circle? Which continent is least penetrated by inlets of the sea?

B 4. In the sections given in the first map how many times is the height exaggerated? Why is this?

5. In a voyage from Liverpool, starting northwards right round the three continents of the Old World, through what oceans would a ship sail in order?

6. Name the great fold-mountain systems of each continent, and the great tablelands south of Lat. 30° N.

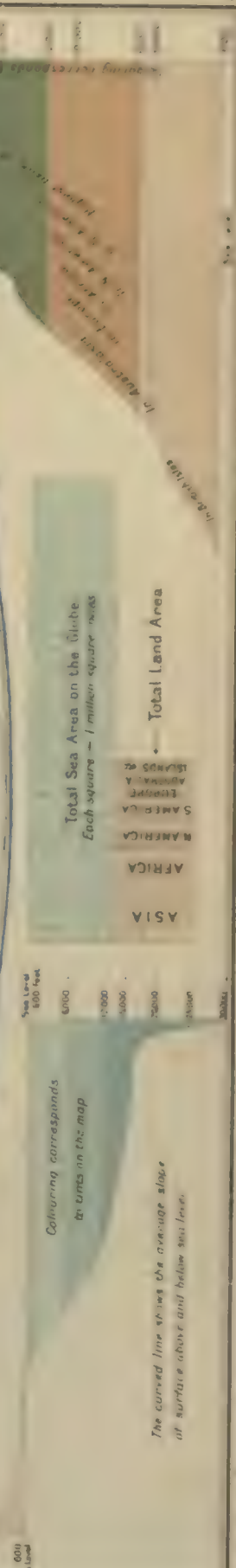
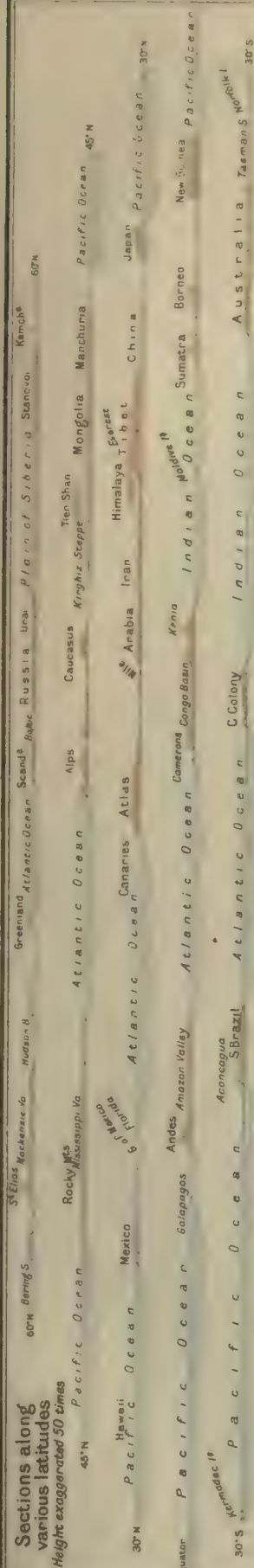
C 4. Write down the great continents in order of size, giving the number of square miles in each to the nearest half-million.

5. Is most of the Sahara above the 600-foot contour? is most of the Amazon basin below it?

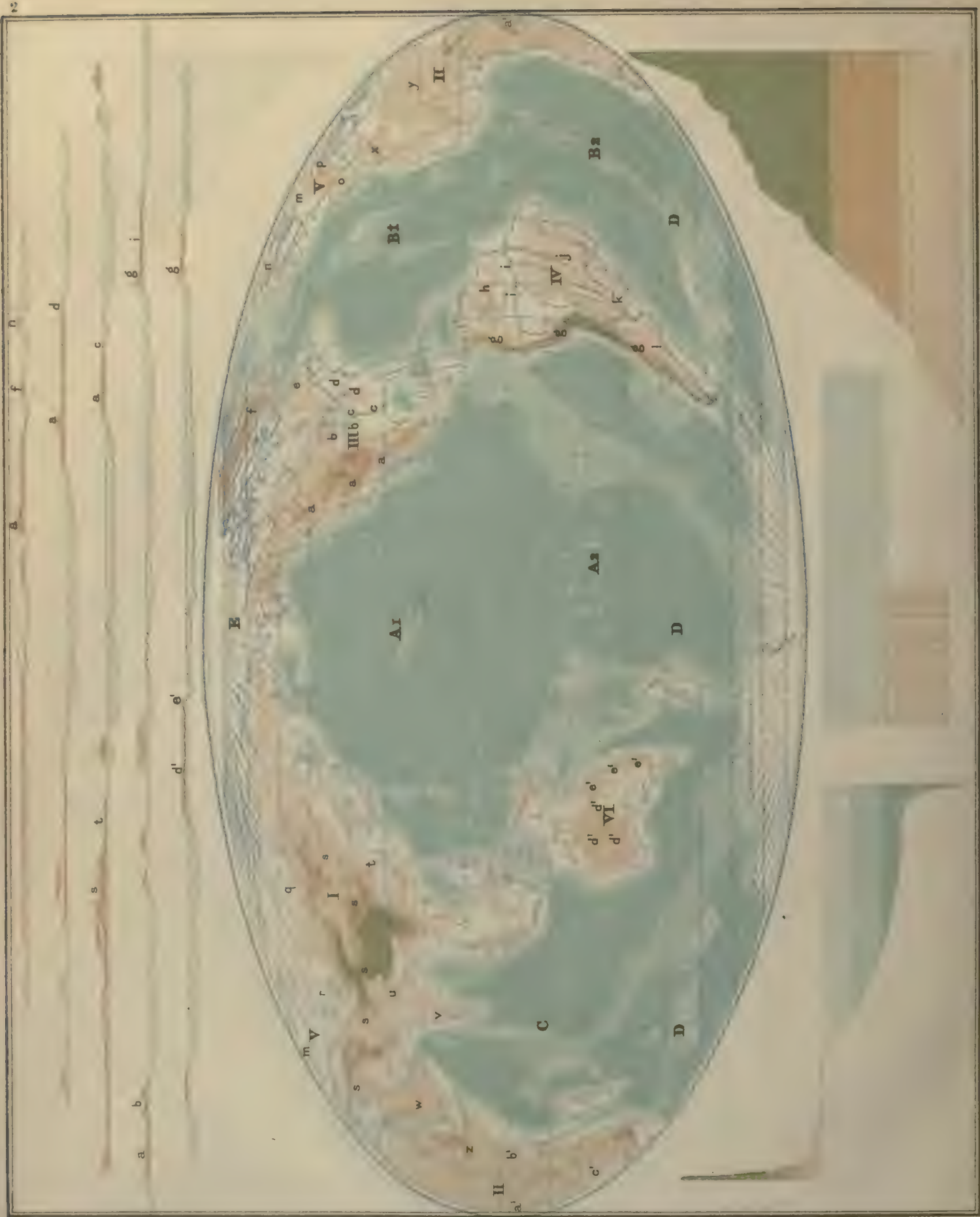
6. Where are the most notable instances of extended continental shelves? where the most remarkable cases of sudden changes in level from high mountains to deep seas?

THE WORLD.—Physical.

Sections along various latitudes
Height exaggerated 50 times



THE WORLD.—Physical.—Test.



Seasons, Zones, Tides

After investigating the causes which have led to the formation of the earth and its surface-features, it is natural to inquire into the conditions necessary for the life of plants and animals. A certain proportion of heat and moisture, besides air, is obviously indispensable for any form of life, as we know it. Now, these necessities are distributed very unevenly over the earth's surface. We know that the north of Asia and the Antarctic continent are intensely cold, while the equatorial regions are very hot. In some regions there is a rainfall of 600 inches a year, in others practically none. Some countries have but slight variation between winter and summer, others have differences of over 100°. The relation of the earth to bodies outside itself, especially to the sun and moon, must be determined to account for the facts. By measurement and calculation the earth is found to be much larger than the moon, and much smaller than the sun. A football, a grain of No 6 shot, and a pin's head represent roughly their relative sizes. If the earth were perfectly smooth, without difference of land and water, and without atmosphere, and if the sun and moon and earth were stationary, there would be no alternation of day or night or changes of temperature. One half would be always in sunlight and there would be

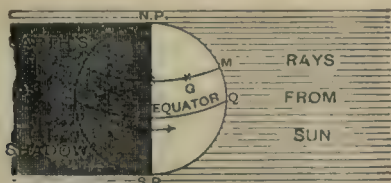


FIG. 30.

nothing to hinder the even mathematical distribution of heat. Owing to the great distance of the sun the heat rays may be considered to reach the earth in parallel lines. Those which strike the surface at right angles are more concentrated and give more heat than those which do not. Hence there would be a centre of heat at the middle point of the hemisphere facing the sun. A gradual diminution of heat would take place as the distance from this centre increased. If the earth is supposed to revolve upon an axis at right angles to the line joining the centres of earth and sun once in twenty-four hours, this heat-centre would revolve round the globe along a line called the equator, and we should have parallel zones of heat on either side of this line, diminishing in intensity until the extreme points of the imaginary axis (the poles) were reached. The diagram of a Perpendicular and Oblique Ray, supposed to be cylindrical and cut on the same plane, shows

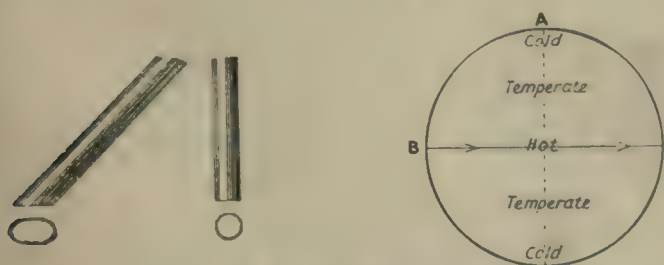


FIG. 31.—HEAT RAYS AND THE GLOBE.

the concentration of heat in the case of the perpendicular ray, the same amount being distributed over a much smaller surface than if the ray falls obliquely. The difference in distance between *A* and *B* and the sun is so small as to make no difference. It is but four thousand miles compared to over ninety million, the total distance of earth from sun. These imaginary conditions, however, do not account for the four seasons, and their variation north and south of the equator, or the varying length of the daylight, nor do they enable a definite line to be drawn between the hot, temperate, and cold zones. If the earth is supposed to revolve round the sun once in a year, and to have its axis inclined (i.e., not at right angles) to the line joining the centres of earth and sun, and yet always pointing in the same direction in space, these differences can be accounted for. The angle made is about $66\frac{1}{2}^\circ$.

The diagrams show clearly the results. It will be seen that the perpendicular rays of the sun reach a certain distance north or south of the equator; the limits (at *D* and *B*) being reached in midsummer in either hemisphere (June 21 and December 21), a time which corresponds to midwinter in the opposite hemisphere.

At these turning points (or Tropics) definite lines can be drawn. Between them we have the torrid zone.

It will be noticed also that for six months alternately either pole is in continuous daylight, the change from darkness to light taking place when the sun is immediately

FIG. 32.

The imaginary plane, in which lies the straight line joining the centres of the earth and sun, is called the "Plane of the Ecliptic." When the moon is in this plane, eclipses are possible. Why?

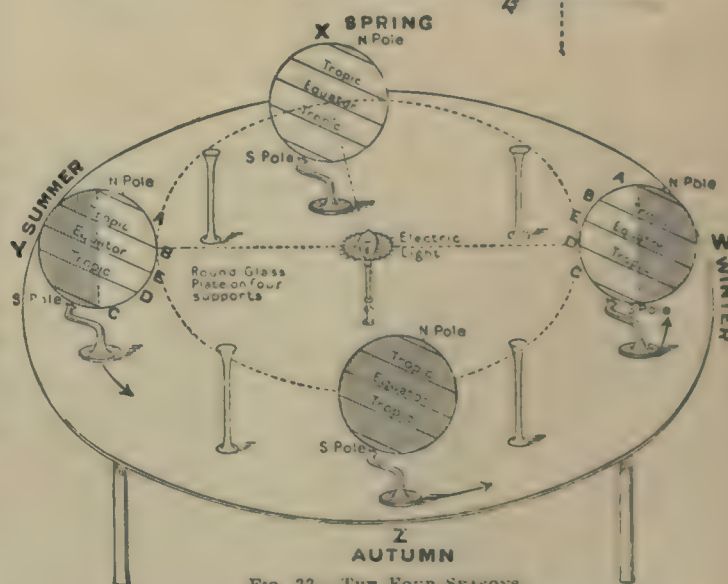
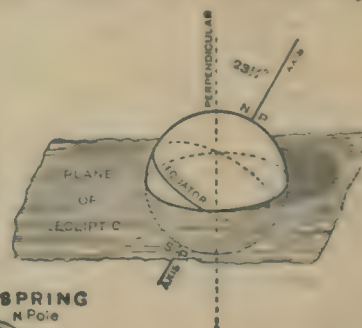


FIG. 33.—THE FOUR SEASONS

(The names are correct only for the northern hemisphere.)

The electric light represents the sun, the model globe the earth. The glass plate, which rests upon the table, corresponds to the "Plane of the Ecliptic." The axis of the globe is inclined at its proper angle, and the globe is moved round, just as the earth goes round the sun in its yearly course. Comparative sizes and distances are, of course, hopelessly incorrect. What seasons would correspond to the points *W*, *X*, *Y*, and *Z* in the southern hemisphere?

over the equator when day and night throughout the world are equal (twelve hours each). This takes place on March 21 and September 22 (the Equinoxes), when the earth is at X and Z. The variation of the comparative length of day and night at different seasons of the year is slight near the equator, great as the poles are approached. There must be a point fairly near to either pole where there is daylight for one day in the year for twenty-four hours exactly (at A and C): here a line is drawn which determines the division between the Temperate and Frigid Zones. The two equinoxes naturally occur during the season of the spring or autumn in either hemisphere. These variations of heat could be counted on with certainty if the earth's surface were all of equal character and quite smooth, and if there were no atmosphere. The movements of the oceans and the air, the

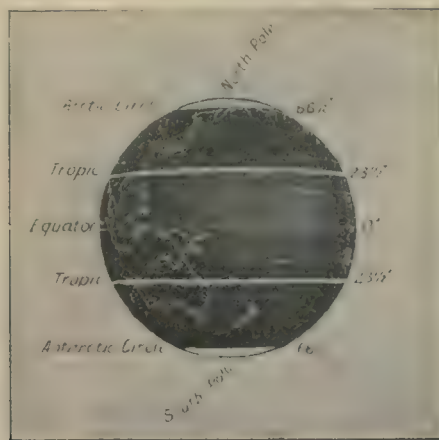


FIG. 34.—"THE ZONES."

The method of measuring the angular distance of the Tropics and Arctic and Antarctic Circles from the Equator is explained later on.

varying results of heat upon land-and-water surfaces, and the differences caused by the slope and elevation of land, of course prevent any such mathematical regularity.

QUESTIONS.

1. In what zones are these latitudes: 70°, 60°, 50°, 20°?
2. Which zone has the largest area?

B By observation it has been found that the actual distance of the sun from the earth varies: that is, the earth does not describe an exact circle round the sun. It is found to travel in an ellipse (or sort of oval). When nearest to the sun, on January 1 (about 91½ million miles off), it is said to be in perihelion; when farthest off, in aphelion (94½ million miles). In our summer the earth is actually more than three million miles farther from the sun than in our winter, as our cold season corresponds with the position of the earth in perihelion.

The influence of the moon upon the earth, as regards heat, may be disregarded, but its attractive power on the earth is proved by the fact that high tides correspond with full moon. The highest or spring tides are caused when the moon and sun are both attracting the surface in the same direction. The lowest or neap tides occur when the sun and moon are exerting their attraction at right angles to each other. Oddly enough, there is found to be a contemporaneous high tide also at the opposite side of the globe from where the first-mentioned high tide

is found. This is accounted for by the fact that the whole body of the earth is attracted slightly out of its course by the double attraction of sun and moon, and that the water is, as it were, slightly left behind. In any case, there are high tides twice a day, and not once, at any given spot, as a result of this double tidal wave, which is always moving round the earth. The diagrams make the above facts clear.

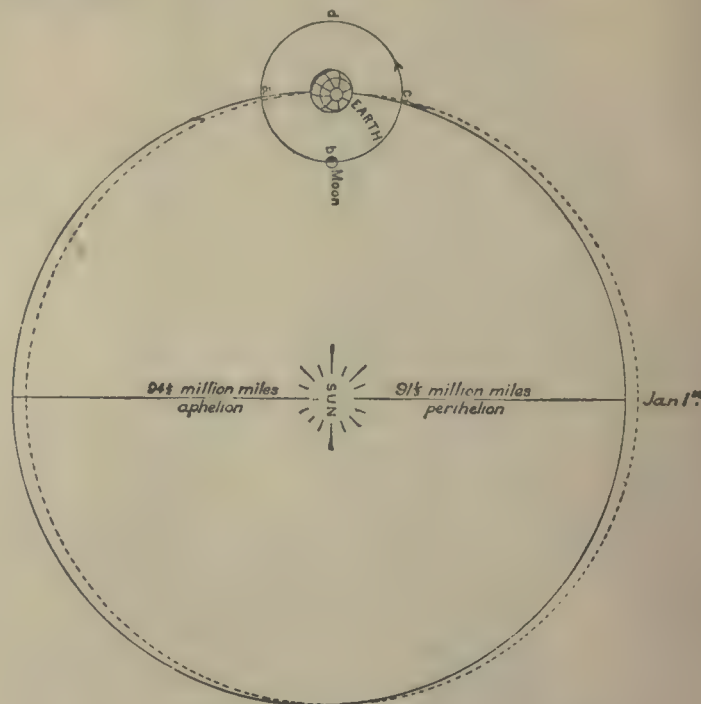


FIG. 35.—RELATIONS OF SUN, EARTH, AND MOON IN SPACE.

The black orbit represents the earth's yearly course round the Sun. The dotted line represents a circle with the sun as centre. The comparative distances and sizes are of necessity not correct. The moon revolves round the earth once a month (about), in a plane not quite corresponding with the "Plane of the Ecliptic."

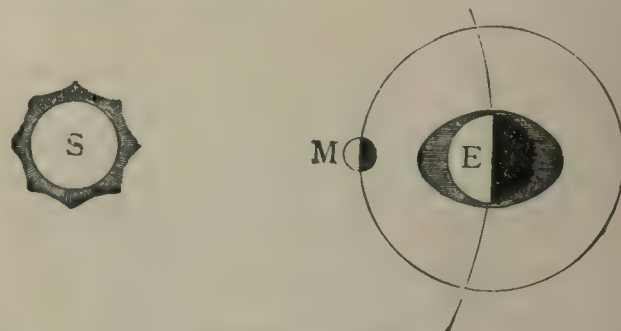


FIG. 36.—SPRING TIDES.

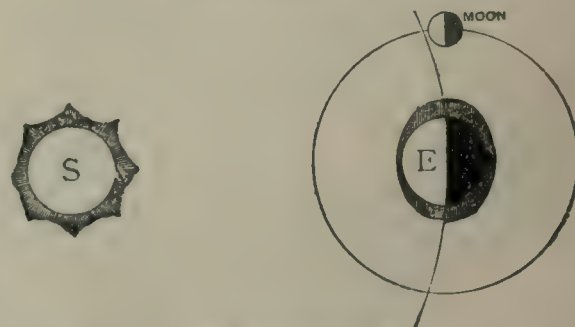


FIG. 37.—NEAP TIDES.

QUESTIONS.

- B** 1. If the plane of the moon's orbit exactly coincided with that of the earth's orbit (called the plane of the ecliptic), would there be a lunar eclipse once a month?
2. The moon shines entirely by light reflected from the sun. At what point (*a*, *b*, *c*, or *d*) in Fig. 35 would there be full moon? When the moon is at *b*, would any light be reflected from it on to the earth?
3. Supposing that the moon takes about a month to complete its orbit, for how much of this time would there be moonshine on earth on the average?
4. An extra day has to be added to the calendar every fourth year (usually). What does this imply as to the exact time (reckoned in days) that the earth takes to complete its orbit?
5. The earth moves faster along its orbit when in perihelion. Does this make the duration of daylight at the south pole longer or shorter than that at the north pole?

C This theory of the tides, as roughly stated above, is called the Statical theory. Owing to the fact that the moon is revolving round the earth, the interval between two high tides is not exactly 12 hours, but 12 hours 50 minutes. As the moon takes about $27\frac{1}{2}$ days to travel round the earth, and about $29\frac{1}{2}$ days to reach the same relative position with respect to the sun and earth—because the latter is moving too—and travels nearly in the same plane as that in which the earth moves round the sun, the moon is, roughly, in the same line as the sun and earth twice during this period, and then the maximum or spring tides are felt. Twice during this period the moon is pulling at right angles to the sun, when low or neap tides are the result. Two great tidal waves then are revolving round the earth, the one beneath the moon the other on the side opposite to it. When the sun and moon are not pulling in the same line, the sun's influence either retards or accelerates the wave, and actual high-water would only correspond exactly in theory with the position of the moon at spring and neap tides. The varying depths of the oceans, and shapes of coastlines, cause great differences between the time at which high tide arrives and the time when in theory it would arrive at any given place. By noticing the difference between actual high-water and theoretical high-water, lines can be drawn upon a map through all places which have high-

water at the same moment and so a co-tidal map can be constructed.

In the British Isles the tide arrives from the west and circles round both north and south. It enters the seas between Great Britain and Ireland, and between the British Isles and the continent from two directions. There is, therefore, a meeting of tides off Belfast and off the mouth of the Thames; the tide that comes from the north down the east coast is really a later wave than the one that it meets off the Thames. The map here given makes clear the reasons. The causes of the high tides in the Bristol Channel and Morecambe Bay are not far to seek.

Pressure, Winds, and Rainfall. Climatic Maps.

A As the earth rotates once each day in an easterly direction (opposed to the apparent course of the sun), the result is that the atmosphere is heaped up round the equator. Here, then, its pressure on the surface would be expected to be heavier. However, the greater heat of the sun near the equator expands the air and relieves some of the weight. Thus a belt of high pressure may be placed on either side of the equator north and south of the tropics. By observation by barometer, such average results have been determined, as are indicated by the figures on the map. At sea level the variation in the height of mercury pressed up by the air pressure in a vacuum tube varies between 28 and 31 inches.

There is a natural tendency in the air to equalize the pressure, and therefore there is always a movement from high-pressure areas to low-pressure areas. These movements are what we call winds. They vary in force, according to the greater or less difference in pressure. From the two high-pressure belts winds naturally blow both towards the equator and towards the poles. The former are called Trade Winds, and are very regular owing to the steadiness of the barometrical averages. Those blowing towards the poles are more variable, especially those in the northern hemisphere, where there is much land to vary the conditions. Those in the southern hemisphere, as they blow chiefly over sea areas, are less interrupted and generally stronger. They are known to sailors as the Brave West Winds, or Roaring Forties. The pressure-belts account for their direction from north to south, the rotation of the earth from west to east causes their deflection. Suppose a body of air to be travelling from the northern high-pressure belt towards the equator; it starts with a speed from west to east of about 800 miles an hour; near the equator a point on the earth's surface is moving about 1,000 miles an hour from west to east, as the entire circumference there is 25,000 miles, and it has to complete this distance in twenty-four hours. Therefore it loses upon the region over which it is travelling, and gets a course from north-east to south-west. Winds thus caused are called North-east Trade Winds. Similarly, the South-east Trade Winds can be accounted for. The winds blowing toward the poles, for similar reasons, gain on the earth, and blow from the south-west or west. These general tendencies are often modified by the conditions met with at the sur-



FIG 38—CO-TIDAL LINES.

face. Water areas take in heat much more slowly than dry ones, but retain it longer. A heated area expands the air over it and makes it lighter, while a cold area has a tendency to send up the barometer, owing to the increased density of the air. Thus a great continent in summer draws in winds from surrounding oceans, and sends them outwards in the winter. In such cases the winds are called Monsoons.



FIG. 39.—"PRESSURE BELTS AND WIND SYSTEMS."

The dotted line indicates the extent of the atmosphere very much exaggerated. The arrows indicate the direction of air-currents on the surface and in the air.

Owing to the alteration in the distribution of heat at different seasons, the various wind belts do not always occupy approximately the same latitudes. They all have a tendency to migrate with the sun. Thus in July all the belts are at least 10 degrees farther north on the average than they are in January (see Plate 4). Again, owing to the unequal distribution of land the belt of greatest average heat (see Plate 3) is considerably north of the equator, so that the equatorial low pressure area oscillates on a central line some degrees north of its theoretical position.

EXERCISES.

1. Supposing that the polar areas are looked upon as being separate areas of comparatively high pressure owing to their low average temperature, write down the seven different pressure belts met with from north to south of the globe.
2. How would air currents be deflected which come from the polar areas towards the equator?

Wind and weather are intimately connected, and the reason is not far to seek. Movements of air naturally bring warmth to cooler regions, or coldness to warmer, but they also bring moisture. All moisture in the air is drawn up by the sun from water areas. The air can contain more water vapour in suspension when it is hot than when it is cold. The condensation of water vapour upon the cold window panes of a heated room, or the moisture seen on the outside of a glass of iced water are familiar instances of this fact. The layers of air near the earth, which acts as a reser-

voir of heat, are warmer than those above them. Snow and hail falling on a comparatively warm day show how this state of things is not rare. Therefore the warm moisture-bearing air that comes from a heated ocean generally forms clouds as it ascends, and comes down again as rain or snow, when the cooler air can no longer support it. Winds, therefore, which blow from comparatively warm oceans against mountain slopes are driven upwards, and are forced to part with their moisture in the form of rain. Where the land is flat or far removed from the sea or on the leeward side of mountains, there is almost of necessity a dearth of rain. (See upper diagram.)

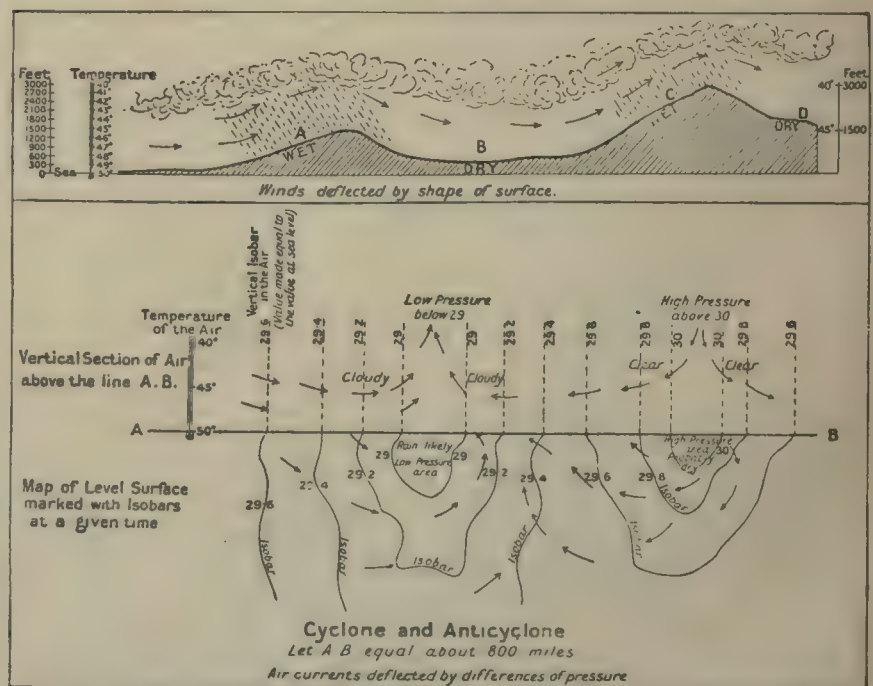
A low-pressure area, as is to be seen on the left of the lower diagram, is called a cyclonic depression, or a cyclone, in weather reports, a high-pressure area an anticyclone. In the former the air currents have a tendency to circulate in a contrary direction to that of the hands of a clock, in the latter they go with the clock. South of the equator the directions are reversed.

In cyclonic areas the winds are drawn upwards, the air gets cooled, and rain is likely. In anticyclonic areas the air is drawn from the cold dry layers above, and gets warmed as it descends, and so generally picks up moisture instead of parting with it.

Alterations in pressure, then, are controlled by the rotation of the earth or by the varying heat of the sun. By these variations winds are caused, which in their turn determine the distribution of rainfall over the earth's surface.

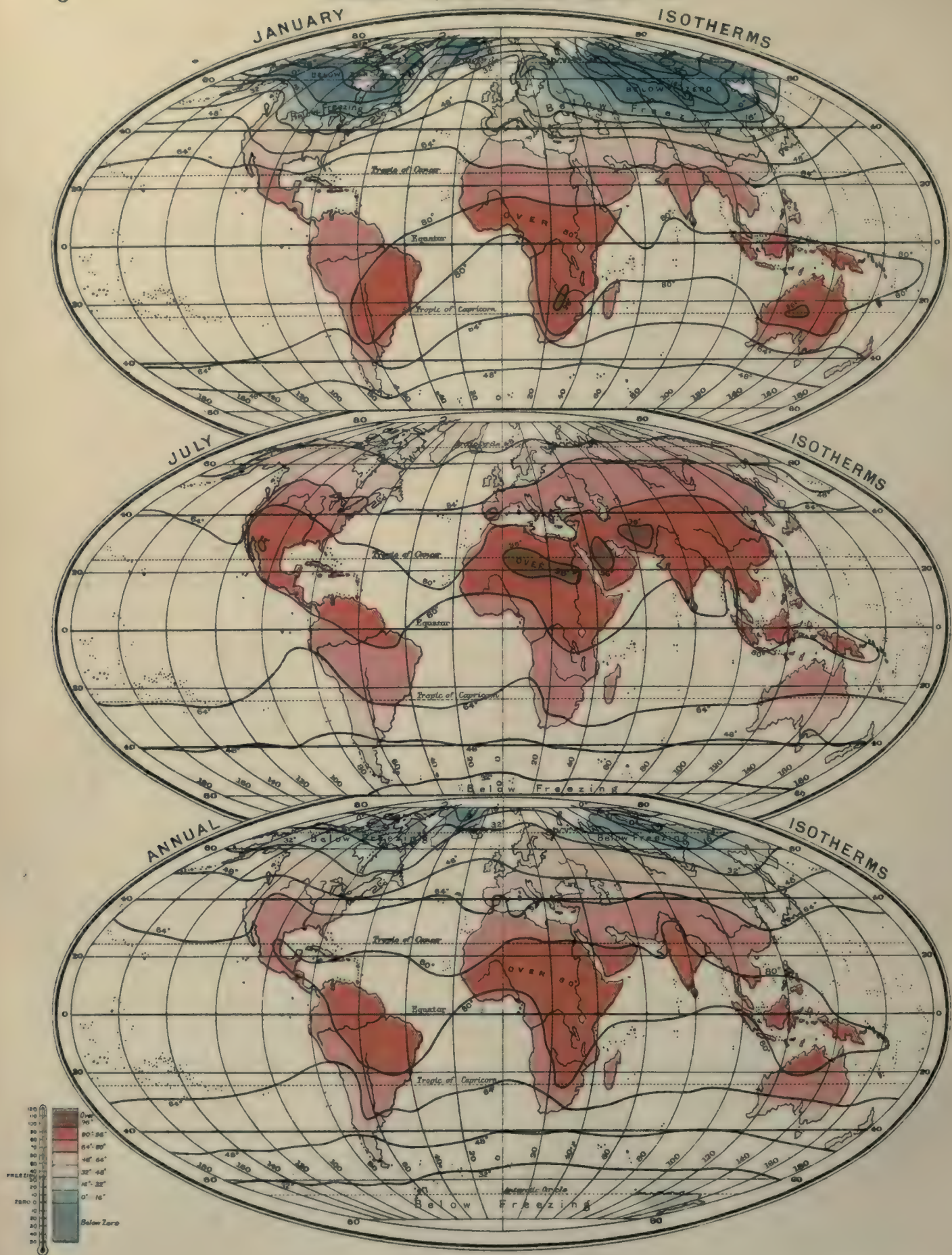
By careful measurements and observation taken over a course of years a series of statistics can be made of any country so as to show its average climate.

In the diagram (Fig. 42) of an imaginary land-area, suppose the heavy black dots to be observatories. The top figures represent the average annual barometer in inches as determined by a series of observations; by drawing lines (Isobars) through places with the same average pressure,



FIGS. 40 AND 41.—CAUSES OF RAINFALL AND OF DROUGHT.

TEMPERATURE MAPS.



Homolographic Projection.

Scale 1: 240,000,000

George Philip, Editor. The London Geographical Institute

a graphic result can easily be arrived at. The middle figures represent average annual temperature. The lines connecting places with equal temperature are called Isotherms. Similarly the rainfall is measured and a system of Isohyets is laid down : the spaces between any two of such lines can be shaded in to show more clearly the rainfall areas. The lower figures indicate average annual rainfall in inches. The Climate Maps of the world given here are constructed on the same principles. In regions where observatories are few, of course the results are not



FIG. 42.—"CLIMATIC MAP."

very accurate, but enough statistics have now been collected to make possible a very fair approximation to the truth.

When it is realised that all natural products (except minerals) depend upon climate, the importance of its study and of graphic representations of the results of observations is at once apparent. A geographer provided with such maps of any country showing climate at different seasons, and also with maps to indicate the arrangement of mountain and plain, could deduce almost all its natural productions and its possibilities of prosperity. Nearly all facts connected with a country, which apparently seem isolated and impossible to remember, when viewed in connexion with such maps at once follow naturally from underlying causes, and become interesting and far easier to store in the memory.

QUESTIONS AND EXERCISES.

A 1. Make a tracing of the above map, but only mark the Isobars. Shade in the areas in such a way that the darkest shading represents the heaviest pressure. Put in arrows to represent what you would expect to be the direction of the wind throughout the map.

2. Make a similar tracing, with isotherms only, and show the gradations of heat by a similar process of shading.

B 1. Make a tracing of the map above, showing Isobars only. Number the Isobars, beginning in the south-east corner, 29.8, 29.9, 30 and 30.1 respectively (i.e. in reversed order). Shade in area as directed in Question A1, and put in arrows to denote the probable direction of the winds.

2. Trace the January Isotherm Map of the British Isles on Plate 12. Instead of the numbers 38, 40 and 42, put 60, 58 and 56 respectively. Then shade in so that the warmer parts have heavier shading.

C 1. Make a tracing of the Weather Chart (of January 9, 1903) from Plate 12. Instead of the numbers 29, 29.2, 29.4, 29.6, put 30.2, 30, 29.8 and 29.6 respectively. Then put in arrows to show the probable direction of the winds. Could you expect fine or wet weather?

2. Trace the outline of the coasts as in one of the Weather Charts on Plate 12. Put in your own Isobars, so as to show a cyclonic centre over Central France; and put in arrows to indicate the probable winds.

Temperature Maps.

A The three maps on the opposite page are formed by plotting in the average results from as many observations as possible collected from observatories throughout the world.

The isotherms represent the average monthly or yearly temperatures at sea-level. If an observation is taken at an elevated station, one degree is subtracted for every 300 feet above sea-level. Otherwise it would be impossible to construct such maps on this scale. Though the isotherm of 72° runs near Mt. Blanc in summer, the average July temperature for its summit would not be 72° but about 20°.

QUESTIONS AND EXERCISES.

A 1. Where are the coldest regions of the earth in January?
2. Why is Cape Horn nearly 16° warmer in January than in July?

3. Write down in order from east to west the isotherms cut by lat. 60° N. in January. Do the same for July.

4. In January, north of the equator, the isotherms bend northwards over the sea and southwards over the land. In July they do the opposite. Account for this.

5. What is the difference in degrees between the January and July temperatures in the Bay of Biscay, the extreme north of Siberia (in long. 140° E.), the south end of the Caspian Sea, the north island of New Zealand?

6. What parts of the world have the highest annual average temperature?

B 1. Most of the hottest area in the Annual Map is north of the equator. Account for this.

2. Account for the fact that both in the January and July maps isotherm 64° (south of equator) bends northwards off the west coasts of South America and Africa.

3. Write down the difference in degrees between the January and July temperatures of Cape Horn, La Plata estuary, Tasmania, the east coast of Australia (lat. $23\frac{1}{2}^{\circ}$ S.).

4. From the Annual Map write down from north to south in order the isotherms cut by the meridian of Greenwich, giving the approximate latitude of each. Account for the fact that the values are not evenly balanced on each side of the equator.

5. Is the annual range of temperature midway between Victoria Nyanza and the Indian Ocean great or small? How high above sea level would you have to go to get a July average temperature of less than 60° ?

6. If Australia were 20 degrees farther south, what would the average July and January temperatures be of its extreme north and of its extreme south?

C 1. Write down the difference between the January and July temperatures of Borneo, Iceland, and Lake Baikal. Account for the difference in range.

2. At what height during the hottest month of the year would the temperature average 32° at the north end of Madagascar, Cape Horn, Madrid, Central Arabia, the North Cape?

3. Write down the Isotherms cut by long. 20° W. and long. 140° E. in January and July, and account for the great differences between them.

4. Explain the influence of warm and cold ocean currents upon the annual isotherms.

5. Make tracings of the maps of India on Plate 65, showing winter and summer conditions. Mark in the isotherms only, and tint or shade the land areas on the same principle as on Plate 3.

6. Why would you expect the South Pole to be colder than the North Pole?

Circulation of the Oceans : Effect on Climate.

A It may be said generally that owing to the heat of the sun near the equator the surface layers of the ocean become lighter than the colder water near the poles, which gradually flows from north and south along the bottom towards the equator. The hotter surface-water near the equator is thus drawn polewards, and, gradually cooling, mingles eventually with the water there, which is slowly circulating along the bottom towards the equator.

The experiment here illustrated shows the process at work. Swimming-baths are usually heated by a similar method. The rotation of the earth from west to east

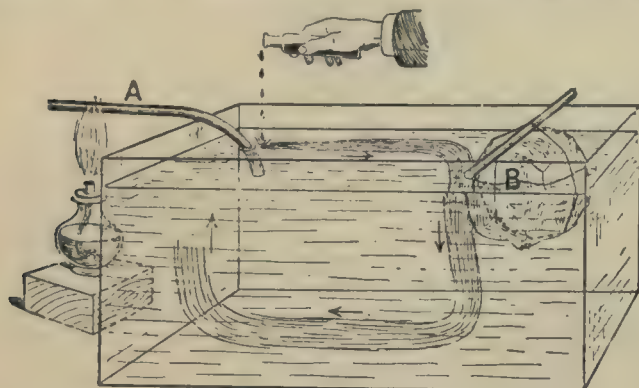


FIG. 43.—WATER IN A TANK TO SHOW CIRCULATION.

A. Heated bar of metal. **B.** Lump of ice suspended in the water. Why does the liquid from the bottle follow the course indicated by the arrows?

deflects the air currents (as is shown on page 16), and these help to accentuate the effect of rotation upon the courses of surface ocean-currents.

The lowest map on Plate 4 indicates the result.

A comparison of the Isobar and Wind Maps (on Plate 4) with the ocean currents there shown, will make clear the causes of the circling motion of the oceans round comparatively motionless centres in latitudes 25° north and south of the equator. The Trade Winds are always pushing the surface-waters towards the west; in turn these currents strike against the continents, are deflected north and south, and then are pushed eastwards again by the prevailing winds, combined with the influence of rotation.

When the warmer surface-water is urged by a steady influence towards the shore it naturally gets banked up and is drawn by gravity downwards, so that on the western coasts of Europe and North America the layer of warmer water is very much deeper than elsewhere in similar latitudes. Similarly on the east coast of North America and Asia the currents setting off the coasts cause the cooler waters from the north to flow southwards, to fill the place of the water drawn off. On the south-west coasts of South America, Africa and Australia, cold bodies of water well up from below and go towards the equator as cool currents. Similar reasons do not here apply.

The names printed in brown on the map on Plate 4 give the most important of the currents. It will be seen

that all the oceanic basins have currents circulating, if north of the equator, in the same direction as the hands of a watch, if in the southern hemisphere in the contrary direction. The result is that in the northern basins warmer water is taken to the north-west coasts of North America and Eurasia, while cold currents are drawn down their eastern sides. The arrangement of currents south of latitude 35° S. cannot be accounted for in a similar way, owing to the very different relations of land and water in those regions.

Besides the general arrangement of great circulating currents, it will be noticed that there are several other less important ocean streams, whose direction is not so readily accounted for. The counter-equatorial currents, for instance, are explained by the fact that in the comparatively windless region near the equator there is no strong influence to urge the surface-water to the west, and it is therefore drawn to the east to compensate the loss of surface-water which forms the north and south equatorial currents, just as in a river a strong up-stream eddy is often found on each side of a rapid, near the bank. In the Indian Ocean, while the north-east monsoons (i.e. October to April) are blowing, the currents are normal, during the south-west monsoons (i.e., April to October) the circulation is reversed.

Influence on Climate and Civilisation.

The enormous effects of the oceans upon climate and the course of civilisation are obvious. Their uniform surface enables the great wind systems to be normally developed over most of the world, and so the temperature of the air is preserved from great extremes. The circulation of their waters brings warmth to the coasts of British Columbia and Western Europe, while cool currents from the poles moderate the heat of the tropics. They are the great reservoir from which practically all the rainfall of the earth is derived, upon the distribution of which depend all forms of life. The development of ocean-going steamers has caused them to become the chief means of uniting civilised communities, just as they kept separate the nations of the past. It is cheaper to send a ton of coal from Cardiff to New Zealand than to a town in central France. The laying of cables has proved also that the oceans are a help rather than a hindrance to telegraphic communication.

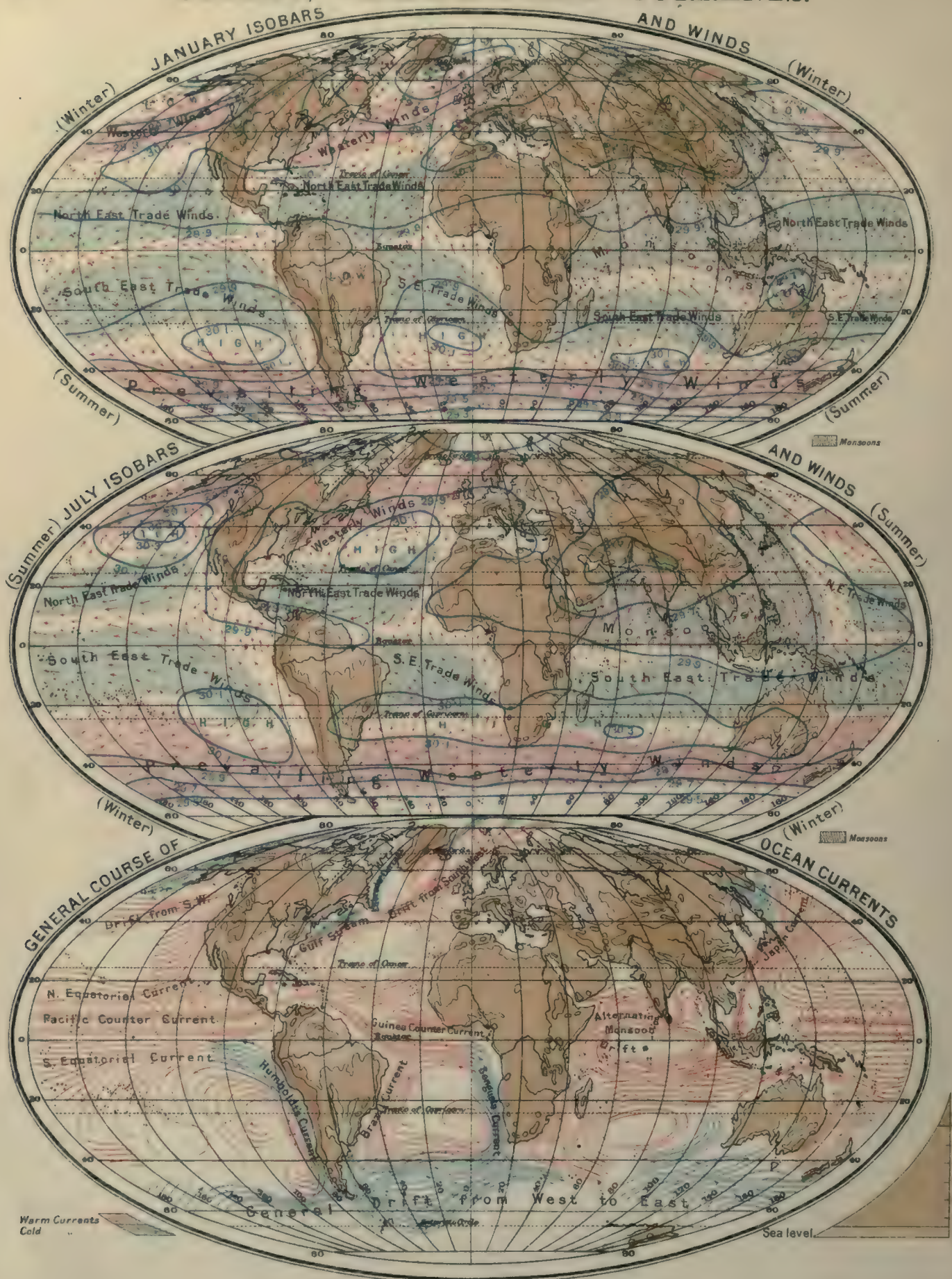
Isobars and Winds.

A The two top maps on Plate 4 are to show the general conditions at the two opposite seasons of the year throughout the world. The Isobars are laid down as the result of comparing all available statistics. Of course their values are reduced to sea-level values.

The distribution of land and water, and the effects of heat or cold upon these two different kinds of surface, of course, modify very largely the regular conditions shown in the diagram on page 16.

In the centre map it is quite easy to make out the two high-pressure belts north and south of the equator, between the Trade Winds and the Prevailing Westerlies.

ISOBARS, WINDS & OCEAN CURRENTS.



They are naturally broken by the intervention of land masses. In the top map the gradual lessening of pressure between these belts and the equator can be well seen. The low-pressure areas are obvious on the oceans about latitude 60° north and south. The higher pressure round the North Pole appears best in the January map. The similar conditions near the South Pole cannot be seen, as the maps do not show the isobars far enough south, owing to the scantiness of our present knowledge.

B The typical monsoons between Asia and the Pacific are really reproduced on a smaller scale in the Americas, Africa and Australia.

QUESTIONS AND EXERCISES.

- A**
1. Where is the highest pressure area, and where the lowest on the two maps? Mention the actual pressures and the time of year in each case.
 2. How do you account for the high pressures over the centres of North America and Asia in January, and the low pressures in July over those same regions?
 3. Latitude 20° N. is well in the middle of the north-east Trades in July. In January these winds are mostly to the south of it. Why is this? How does lat. 20° S. stand with regard to the south-east Trades in January and July?
 4. The winds blow from land to sea in India during January, from sea to land in July. Why is this?
 5. At what season does the extreme south-west of Africa and Australia feel the influence of the prevailing westerlies, and why?
 6. In what wind systems are the following parts of the world: Madagascar, Ireland, New Zealand, Ceylon, Southern Chile, Central America, East Coast of Australia, New Guinea?

Ocean Currents.

A The lowest of the three maps shows how, generally speaking, the great ocean currents follow the wind systems. The reasons for the counter equatorial currents have been stated on page 18.

QUESTIONS AND EXERCISES.

- A**
1. Make a tracing of the Current Map and place it over the Wind maps. Notice the general correspondence of winds and currents.
 2. Name the chief currents of the Pacific, the North Atlantic, and South Atlantic.
- B**
1. North America and Eurasia receive warm currents on their western shores, cold currents on their eastern. Can you account for the facts?
 2. In what way are the currents which flow northward from the South Polar regions along the south-west coasts of Africa and South America not analogous to the cold currents which flow southward from the North Polar seas?
 3. Compare the Japan current with the Gulf Stream, the Brazil current with the current off New South Wales.
 4. Most of the warm water which reaches the British Isles does not come from the Gulf of Mexico? Is this true?
- C**
1. Account for the difference in climate between (a) the north and south of Iceland, (b) the Natal coast and the coast of German South-West Africa, (c) Vancouver and Newfoundland, (d) Ireland and Sakhalin?
 2. Why are icebergs common off Newfoundland, but unknown off Scotland?
 3. Account for the existence of the Sargasso Sea where the tropic goes through the North Atlantic.
 4. If the earth rotated from east to west, what kind of currents would flow off the British Isles, Kamchatka, and Labrador?

Rainfall.

A The distribution of rainfall as shown on Plate 5 can in almost every case be accounted for easily by the reasons given on page 16. It must be remembered also that winds blowing from cooler to warmer regions (as the Trade winds) naturally do not drop so much moisture as winds which become gradually cooled as they travel away from heated areas. In the equatorial regions the great updraught caused by the sun's heat causes the air currents which reach those latitudes to ascend and become cooled: hence the rainy belt round the equator.

B The name of "Convictional Rains" is often given to the equatorial downpours, and "Cyclonic Rains" to those caused by the low-pressure storm areas, so commonly found along the coasts in temperate regions, especially in winter.

On page 16 the diagram of prevailing winds divided the globe into seven belts, the Equatorial Belt, the two Trade-wind Belts, the two Belts of Prevailing Westerly Winds, and the two Polar Areas.

Seven Rainfall Belts correspond.

The Equatorial Rainy Belt caused by convection, the two Trade-wind Belts often deficient in rainfall, especially on the western sides of continental areas, the two belts north and south of these with plenteous rainfall on their western shores and no great lack even inland, and the two polar areas, where the extreme cold prevents the air from holding much water vapour. So it is only on their edges that much rain or snow reaches the surface.

Seasonal Distribution.

C It is generally true to say that the equatorial regions get rainfall throughout the year. The maximum precipitation, however, corresponds to the time when the sun is directly overhead, and therefore there is a tendency for two rainy seasons and two comparatively dry seasons to be formed in lands near the equator. The inland parts of continental areas generally get their most abundant supply of moisture in summer, when the winds are drawn inwards.

In the temperate regions the coast districts generally receive most rain from winter storms, but at all times they are well supplied.

As the wind belts migrate north or south according to the seasons, so the influence of the prevailing westerly winds varies. For example, Cape Town and the south-west corner of Australia are within their influence when the sun is nearly over the northern tropic, and so they have only a winter rainfall. Natal and the east coast of New South Wales, on the other hand, receive most rain at the opposite time of year, when the south-easterly Trades reach farthest south.

The countries of Southern Europe have a dry summer, owing to the fact that the influence of the south-westerly winds passes north of them, while the north-east Trade-wind system, helped by the great heat over the Sahara, exercises a powerful indraught of wind from the north-east, and so deprives Eastern Spain, Italy, Greece, Asia Minor and Syria of much of their share of rain at that season.

Rainfall and Vegetation.

A That the growth of plants is impossible without warmth and moisture is, of course, obvious, but the amount of heat and moisture required for different species varies. A slight knowledge of the conditions necessary for the successful production of the chief vegetable commodities accounts almost at once for their distribution throughout the globe.

In comparing the Rainfall and Vegetation Maps (on Plate 5), allowance must be made for the results of evaporation and elevation. In countries far removed from the equator less rainfall is of course required to keep the ground fertile than in the tropics. No dry deserts are to be found far outside the hot belt.

The barren wastes that surround the North Polar basin are due to want of heat rather than to want of rain.

The different conditions caused by elevation above sea-level are not likely to be forgotten. In Mexico, for instance, it is possible to go by train in a single day from the tropical jungle of the coast upwards through every kind of vegetation to the snows of the central highland.

In the Vegetation Maps on Plate 5 it will be seen that the chief products can be arranged roughly by their latitudes. In the north of North America and Eurasia a great belt of natural forest is to be found wherever enough rainfall is ensured. The barren grounds of the extreme north slowly give way to stunted fir woods. These, in turn, gradually increase in vigour, and become more and more mixed with the various deciduous trees common in the British Isles.

In the central region of North America the isotherms in summer bend far to the north and make the open grass plains often suitable for wheat culture. Hence the importance of the Canadian north-west. Wherever the natural northern forest gives way in these latitudes wheat growing becomes important, as in most of Central Europe, the upper Mississippi basin, Russia and Central Siberia. Level treeless plains, of course, make ploughing easy. Cold winters help to break up the soil. Wheat requires underground moisture and deep mould for its long tap-root. The hot summers of the continental areas, and the longer days of the higher latitudes bring the grain to early maturity.

When the rainfall is insufficient for wheat growing, or the character of the surface is unsuitable, sheep and cattle rearing often become the leading pursuits in these latitudes. The countries along the western border of Europe are also cattle countries, owing to the fact that the too abundant rains of summer are more favourable for the growth of rich grass than for the ripening of grain.

Warm, sunny slopes, a dry summer, without extremes of cold or moisture, are the conditions necessary for wine-production. France, Spain and Italy find their counterparts in Cape Colony and South Australia.

Somewhat similar conditions are the cause of the great importance of maize (or Indian-corn) in the United States and southern Europe.

Inside the tropical belt will be noticed a variety of plants, all of which require plentiful moisture and heat. Rice flourishes best on low tropical lands, where it is possible to keep a constant supply of water near its roots. Irrigation is usually employed for this purpose, and tropi-

cal deltas are generally the most favourable localities. Cotton and cane sugar require very fertile ground and a hot sun, but not so much water as rice. Tea prefers mountain slopes with abundant rainfall and good drainage, and coffee and cocoa flourish in similar conditions. Greater warmth is necessary for their successful production, and hence they are generally found on the lower slopes. (See views in Part 4.)

In the equatorial forest regions the great heat and rainfall cause vegetation to grow so freely that the labour of clearing often prevents plantations. Hence their chief commercial products are rubber, oil-nuts and certain valuable kinds of timber, such as mahogany, none of which require cultivation.

QUESTIONS AND EXERCISES.

- A** 1. Write down the parts of the world where the annual rainfall is heaviest, and where least.
2. Why are the arrows near India doubly barbed?
3. What number of inches does the isohyet between the darkest blue and the next shade of blue indicate? What the isohyet between the light blue and light brown?
4. Why is Central Asia dry, New Zealand wet, British Columbia wet, the west coast of North America (south of lat. 40° N.) dry?
5. Where are the two most extensive tropical forests? where the greatest deserts?
6. Trace the Rainfall Map, shading in with pencil the area coloured by the blue tints. Place this over the Natural Vegetation Map. Are all the deserts clear of the pencil shading? Are there any tropical forests in the unshaded part? Are there any forest regions anywhere else, which are in the unshaded parts?
7. What parts of the world produce the most wheat? What conditions are favourable to its growth?
8. What are the most important cultivated crops in the tropics?
9. Name the most important natural products (other than minerals) of Africa, North America, South America, Australia, New Zealand, India and Egypt.
10. What sort of timber would you expect to come from Central America, what from Canada and the Baltic?
- B** 1. Account for the great desert areas which extend over Northern Africa and through Central Asia.
2. Account for the great rainfall of the Amazon Valley and Borneo.
3. Why is the rainfall within the arctic circle so small, except in Norway?
4. Why is the rainfall great at the east end of the Black Sea, and small in Central Spain?
5. Western Europe and Western North America (north of lat. 40° N.) have rainy coasts. Why is this? Why is the rain in Europe distributed much farther inland?
6. Account for the distribution of forests in Australia and Southern Chile.
7. What are the chief wool-producing countries?
8. What conditions are favourable to rice and cotton growing, and what parts of the world produce them best?
9. Is there any part of the world where natural products flourish in spite of scanty rainfall? Why do some of the rainiest parts fail to produce crops of commercial value?
10. Compare the products of Argentina, South Africa, and Australia (south of the tropic). Do similar conditions cause their resemblance?

- C** 1. Account for the dry regions on the western sides of continents near the tropics of Cancer and Capricorn.
2. Can you give any reason for the dryness of the extreme east of Africa?
3. Compare the rainfall and products of the South-eastern States of America and of Eastern China. What similar causes account for the resemblance?
4. Do the same in regard to Australia and Africa south of lat. 10° S. Also for Queensland and Madagascar.
5. How far is it true to say that certain products belong to certain latitudes? Give examples from the maps for and against this statement. Try to explain the exceptional cases.

RAINFALL & VEGETATION.

5



Homalographic Projection
Scale 1:240,000,000

Adapted from the "World Atlas" by the National Geographic Society

Position on the Globe.

A model of the earth can be readily made, but it is not so easy to draw in the outlines of the continents and to mark each locality in their correct relative positions. Therefore some method of determining the position of places on the globe is obviously essential. On a flat surface such as a square sheet of paper the position of any point is easily recorded by means of dividing the whole into equal squares and by counting the number of squares between the point and any two straight lines cutting each other at right angles. Thus,

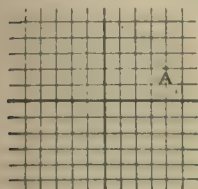


FIG. 44.—POSITION OF A POINT.

in the diagram, the point A is at a distance of four squares counting to the right from the perpendicular line, and two counting upwards from the horizontal. On any sized square divided in the same way the relative position of A can be easily determined. On a globe, however, squares cannot be thus employed. Some other method must be used. If the globe did not revolve evenly upon an imaginary axis, there would be no points upon it from which to start; as it is, the two poles can be marked as definite starting points. Midway between them a circumference can be drawn called the equator. A circumference can be divided into any number of parts, and by general custom a circle is divided into 360 parts, each being called a degree.

By joining each of these 360 points to the centre, 360 angles are formed, each one being called a degree in angular measure. From either pole lines can be drawn to each of these 360 points on the equator, and these are called lines of longitude: these will in reality be found to be circles passing through the poles. Each semi-circle thus formed



FIG. 45.—“ANGULAR MEASUREMENT.”

between the poles could be divided into 180 degrees, and lines drawn through the points thus determined parallel to the equator. These are called lines of latitude. (In actual practice a rather different system has to be adopted owing to the slight gradual flattening of the earth towards the poles.)

In the photograph (Fig 47), the globe is thus divided, every fifteenth degree of latitude and longitude being drawn in chalk.

It will be at once seen that the entire surface is thus divided into known areas. Only a system of numbering is required to describe the position on the globe of any given division. Generally the Observatory at Greenwich is taken as the point through which the starting line of longitude is drawn. This is called 0°, and there are then 180° both east and west of it.

In latitude the equator is taken as 0°, and there are then 90° north and south of it. The two poles being 90° N. and S.

Thus if we say a point is 25° E. and 30° N., we only have to find the line of long. 25° E. of the Greenwich longitude and find the line of lat. 30° N. of the equator. The point of intersection is the one required. Any point not exactly on a degree line can be indicated by sub-dividing each degree into sixty parts (called minutes) and each minute into sixty parts (called seconds).

Lines of latitude and longitude are then simply drawn

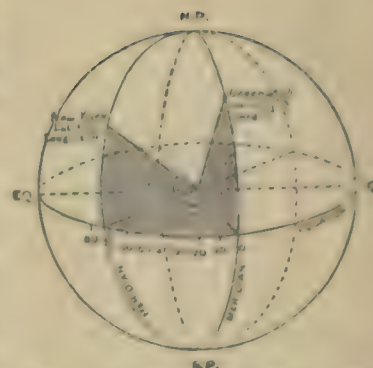


FIG. 46.—“DIVISION OF CIRCLES.”



FIG. 47.—“PARALLELS (LAT.) AND MERIDIANS (LONG.).”

on mathematical principles for the sake of convenience if it is required to indicate or record any spot upon the earth's surface. All maps are drawn by the aid of such lines, and all calculations for position are thus made. The former are often referred to as Parallels, the latter as Meridians. Why?

It will be seen at once that while the distance between lines of latitude is approximately the same all over the globe, the distance between lines of longitude decreases as the poles are approached, until it becomes nil.

Thus at the equator a degree of longitude = about 69 miles, at latitude 10° N. or S. about 68 miles, at lat. 20° about 65, at lat. 30° about 60, at lat. 40° about 53, at lat. 50° about 44, at lat. 60° about 34, at lat. 70° about 24, at lat. 80°, about 12 miles. A degree of latitude varies between 69 and 70 miles; it gradually increases in length from the equator to the poles, as the earth is not a perfect sphere.

B The slight flattening at either pole causes a difficulty in the drawing of lines of latitude. For if the globe were cut in two by a plane passing through the poles, the section would not be a circle.

aluminium, each representing a portion of a huge globe. has been partially produced in France, but, though absolutely true to nature, is obviously too cumbrous and expensive for general use.

If the object is to get a representation of part of the earth's surface upon a flat sheet, the first method that would naturally occur to most would be to portray the globe as seen from outside. By imagining the spectator at an infinite distance, half the globe can thus theoretically be comprehended. A photograph of a globe roughly gives such a result. Here it is obvious that the parts near the edge are much distorted. Any measurements must be wrong; for example, the lines *A B C* and *A D C*, though in reality equal, are far from being so represented in the photograph.

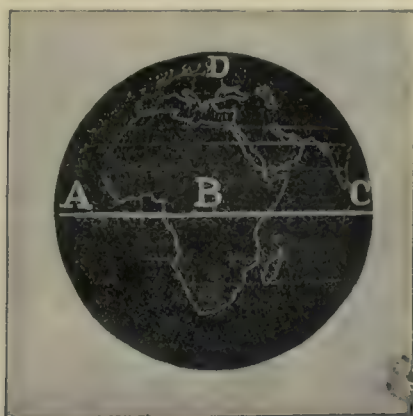


FIG. 50.

The general purpose of other methods, which are arrived at by accurate mathematical calculations or measurements, can be easily pointed out by some simple experiments.

Imagine a hollow glass globe with the features marked upon it in black. Place a brilliant concentrated light in the centre, and encircle the sphere with a cylinder of paper. The features would then be projected as shadows upon the inside of the cylinder. If these were fixed there by photography, the cylinder could then be opened out, and a map of the world produced in one sheet. Here it is obvious that an enormous exaggeration of size is found as the poles are approached. The actual polar areas cannot be shown at all. Maps on Mercator's projection are made by a modification of this method, and give a most misleading idea of comparative areas. For instance, Africa, which appears on such a map as about equal in size to Greenland, is in reality nearly fourteen times larger.

A similar experiment might be carried out by placing a hollow cone upon the sphere (as in Fig. 52) or placing the sphere inside a square box so that it touched each of its six sides. The shadows can be projected as before. The cone could then be opened as in the diagram (Fig. 53), and the box taken to pieces, when the entire world would be represented on six square maps.

Great caution, then, must be used with regard to maps.

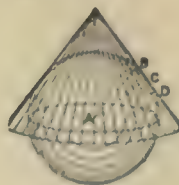
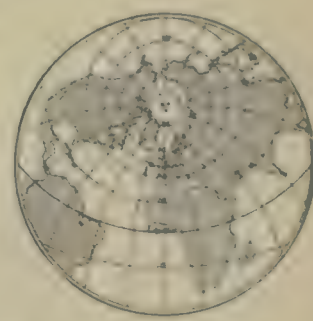
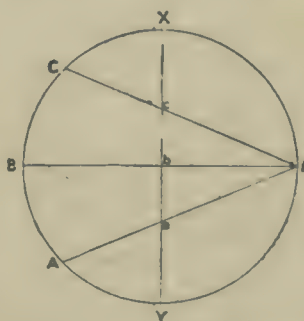
FIG. 52.
CONE OVER A SPHERE.

FIG. 53.

They are at best a poor attempt to represent realities. Different projections must be chosen for different purposes. In some maps areas are correct, in others compass bearings, in others the shapes of countries. No one method of representation on a flat surface is accurate for all purposes.

In all maps showing a large area, measurements cannot be made from the scale given, except in certain directions. The scale is only correct as a rule along the central parallel or meridian, or if the measurement is made from the exact centre of the map.

B An attempt to modify this first projection, which is called Orthographic, is natural. The central portions might be reduced and the parts round the edge made larger. By cutting the globe in half and placing a flat piece of paper (the plane of projection *X Y*) across it, from the central point (*P*) of the surface of one hemisphere, thus formed, a series of straight lines can be drawn, through the paper, to any given points (*A, B, C*) on the opposite hemisphere. The points on the paper (*a, b, c*) are then taken to represent the positions of the actual places (*A, B, C*) on the hemisphere. This is called the Stereographic Projection. Its result, taking Greenwich as the central point of the hemisphere required, is as follows :—

FIGS. 54 AND 55.
STEREOGRAPHIC PROJECTION.

A still further modification of this plan is obtained by making each area contained between any lines of latitude and longitude equal to the same contained area on the earth's surface. Such a projection would be called an Equivalent or Equal-area Projection. The shapes and relative positions of various regions are of course not accurately shown. (See Fig. 56.)

Most projections used in atlases are conventional, i.e. none of the above-mentioned mathematical projections are adopted, but more or less arbitrary variations of them to suit the area represented.

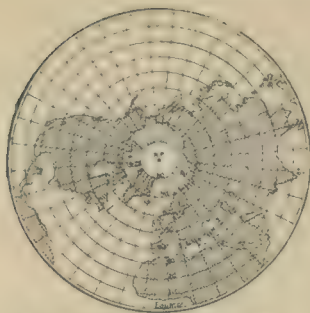


FIG. 56.—HEMISPHERE ON EQUIVALENT PROJECTION.

A very common artifice is to choose the centre point of the desired area and to plot in all the points of intersection of meridians and parallels in their proper bearings, so that all points at the same distance from the centre lie on the circumference of a circle drawn from that centre. The polar maps at the end of this section are so constructed. These are called *Azimuthal Projections* (Azimuth=Bearing). By regulating the distances of the circles it is possible to make each strip between any two circumferences equal in area to the corresponding area on the globe. Thus, the map is equivalent as well as having the bearings correct if measured from the centre. Distances can, of course, hardly ever be directly measured according to the scale.

C The various modifications of methods of projection are, of course, very numerous, and especially so in the case of the developable Conical and Cylindrical systems.

The cone may be made to cut the globe on two lines of latitude instead of touching it at one, as in the left-hand figure below. Thus at *A* and *B* latitudes the map will be exactly accurate, and fairly so between them, or immediately to the north of *A* or south of *B* latitudes. The shape of the cone and the points of intersection, of course, can be adapted to the area in question. Again, two or more cones can be made to touch the sphere at various latitudes, and a more extended area can thus be approximately mapped out. In the case of the cylinder, the points on it can either be determined by direct lines drawn from the centre (as in the centre figure) or by joining the points on the sphere to the cylinder by lines

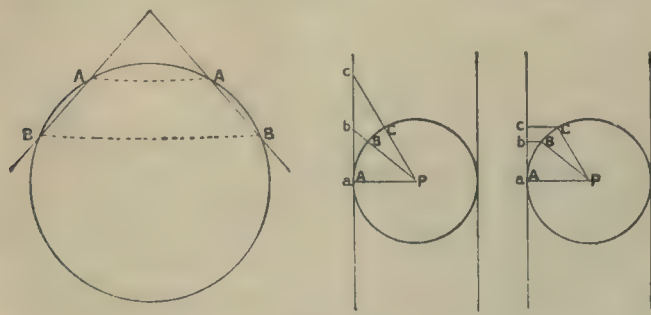


FIG. 57.—CONICAL AND CYLINDRICAL PROJECTIONS.

perpendicular to the cylindrical surface (as in the right-hand figure), or by some intermediate method, as in Mercator's, where the degrees of latitude are made to

increase proportionately to the exaggeration of the degrees of longitude.

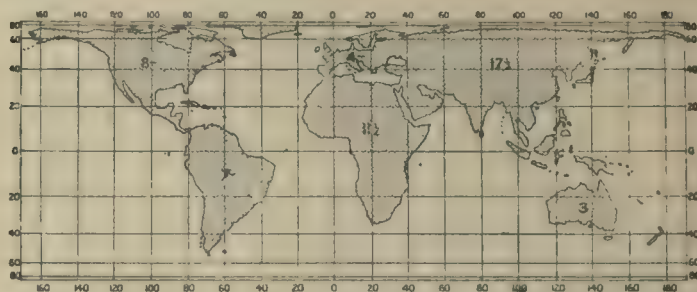


FIG. 58.—"A CYLINDRICAL PROJECTION."

The figures on the Continents indicate their comparative areas in millions of square miles. (The projection is equivalent.)

A useful projection, which is mid-way between the spherical and cylindrical, is the Homalographic or Elliptical (as seen on Plate 8), where the lines of latitude are straight, but the meridians are ellipses, being so regulated as to ensure equivalent areas. The distortion is great to the extreme east and west, but it has many advantages.

In the experiment made with the box, the six maps of the world, thus produced, have a very useful characteristic. Any straight line drawn between any two places represents the shortest possible course between them. In other projections such a result is obtained in a very limited number of cases. The nearest way to connect any two points on a sphere is obviously to bore a straight line through from one to the other. The nearest surface course is not so easily obtained. A simple experiment makes the method clear. Make a hoop of exactly the same internal circumference as the largest circumference of a sphere, as in photograph.

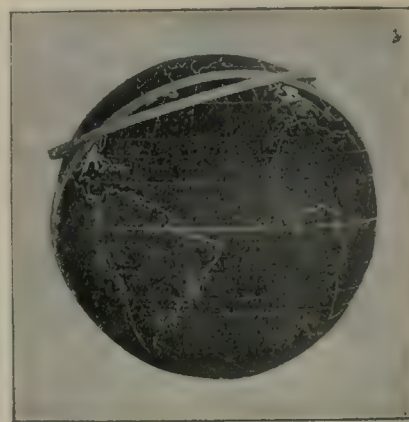


FIG. 59.

This can be moved about so as to cover any two spots, *A* and *B*, chosen on the globe. A smaller hoop could also be so placed as to cut the larger at *A* and *B*. The shortest distance on the surface of the sphere between *A* and *B* is obtained by following the curve of the larger hoop, the arc of the larger circle obviously approximating to a straight line more nearly than the arc of the smaller. On the projection in question all great circles are represented by straight lines, and the

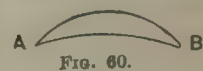


FIG. 60.

maps are called Great Circle maps, and are often useful in navigation. This is also called the Gnomonic Projection. On Mercator's projection (as below) the great circle course as drawn between London and San Francisco is about 500 miles shorter than the straight line on the map. Few would imagine that the nearest course for a bird between the two places would be across the southern point of Greenland, and over the centre of Hudson Bay. The course that has to be taken by ships, round Cape Horn, now appears even more devious than before.

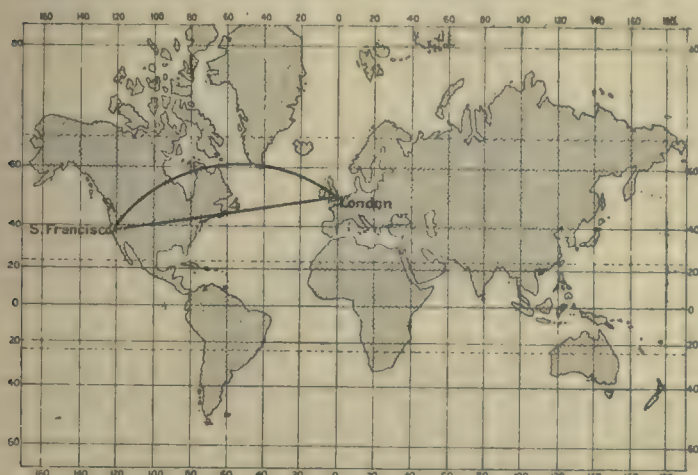


FIG. 61.—MERCATOR'S PROJECTION.

Surveying and Map-Making.

A With an instrument to measure angles it is easy to represent the relative position of any given number of points on a greater or smaller scale as follows:—

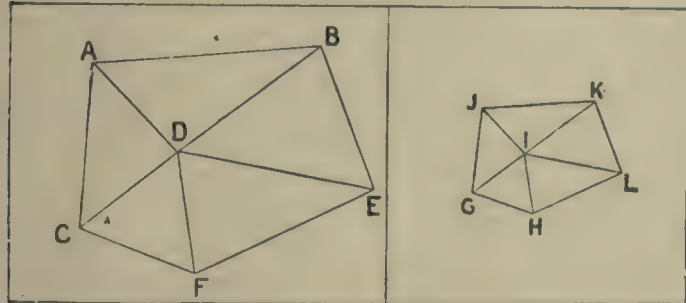


FIG. 62.

Let A, B, C, D, E, F , be any six points.

Take any two points, G and H , to represent C and F . If it is required to place four other points in the same relative positions to G and H which A, B, D and E hold to C and F , all that need be done is to find the angle made at F by CF and FD , and the angle at C made by FC and CD , and to plot in similar angles from G and H . The point I will be in the same relative position as D . Similarly, the points J, K, L can be found corresponding to A, B and E . In a similar way it would be easy by means of simple apparatus to make an exact plan of a school-room or cricket ground on any required scale upon a flat surface. A map of a piece of country can be made in the same manner.

The Ordnance Survey of the British Isles has been constructed on principles similar to this, but of course more complicated measurements have to be made to

find out the relative heights above sea-level of any selected points.

Also, when the position of any point has been found from two others at a known distance from each other by angular measurement, its distance can be ascertained by trigonometry.

For instance, A is 100 yards from B . The angle BAC is 45° , the angle ABC is 83° . The line AC can be calculated to equal 125 yards, BC 90 yards. The trigonometrical survey of the British Isles was started from several very carefully measured bases far apart, and, whenever the systems of triangles met, the error was found to be almost negligible, so accurate had the observations been.

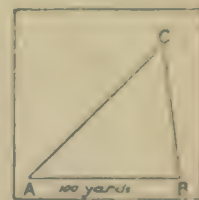
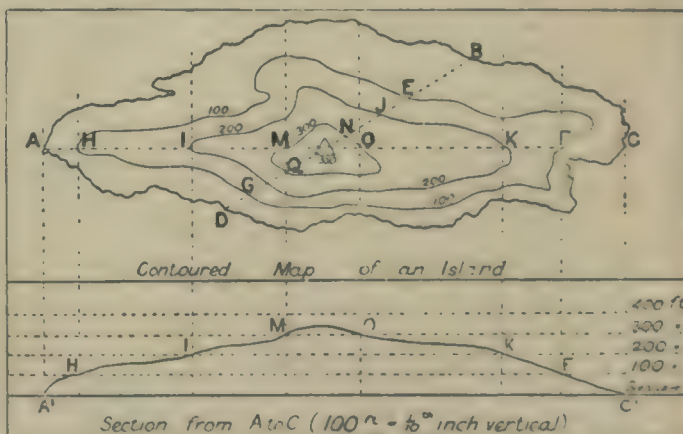


FIG. 63

Many prominent points have small cairns of stones or wooden marks placed upon them to enable the surveyors to get accurate sights from distant points. All over the British Isles are to be found "Bench Marks," left by the surveyors on ascertained points. These consist of a line and broad arrow, and are common on stone gate-posts and corners of churches or well-known buildings. "B.M. 312" on an Ordnance Survey map means that at that point there is a record to show that it has been fixed as 312 feet above sea-level.

When a series of points has been fixed, it is easy on a map to join all points of equal altitude by lines, and so to construct a contour map. Thus, on the map of an island given below, A, B, C and D are on sea-level; E, F, G and H are 100 feet above; J, K and L are 200; M, N and O are 300. To get an idea of how the outline of the island would appear from a boat at a point south of the island, all that is required is to make a vertical scale on a base $A'C'$ equal to AC , and to mark on their appropriate lines the positions of H, I, M, O, K and F , and to draw a line through these, and the desired outline is acquired. This is called making a section.



FIGS. 64 AND 65.

EXERCISES.

1. Make a section from B to D on squared paper, B to D being $1\frac{1}{2}$ inches, and each hundred feet being represented by one tenth of an inch vertical.
2. Draw an imaginary island somewhat similar to the above. Let the highest point, 610 feet, be somewhere near the centre. Fill in imaginary contour lines at every 100 feet, in a natural arrangement. Then draw a section to scale from east to west, as has been done above.

A It becomes easy by a little experience to picture to oneself the shape of any given piece of country from a contoured map.

Below is given a portion of such a map from the Swiss survey on a scale of 1 : 25,000, i.e. one inch on the map represents 25,000 inches of actual measurement, or a little less than 700 yards. Each contour line represents a difference of 10 metres (1 metre = about 39 inches).

The photograph is taken from the point marked *A*, looking towards the north-east. Notice that the map does not run north and south, as is usual. The thin lines on the map which cross at right angles give the points of the compass, *P* being nearly due north of *F*. The figures give the height in metres above sea-level of the nearest contour or adjacent point marked by a dot. Each letter refers to the point near it, marked by a dot, or by a rectangle if a building. The buildings *B*, *C*, *D* and *S* are visible in the photograph, and are there indicated by the same letters. Woods, roads, and streams are indicated in the usual way (see signs for Ordnance maps below). A small triangle means a trigonometrical station used by the survey. The irregular black lines starting from *A* enclose approximately the amount of country shown in the photograph.

QUESTIONS AND EXERCISES.

1. By measuring, the distance from *O* to *P* on the map is found to be 2·5344 inches. The scale is 1 : 25,000 ; find the actual distance in miles.

2. The straight lines drawn at right angles to each other across the map show the points of the compass, the point *P* being nearly due north of *F*. What is the bearing roughly of *N* from *O*, of *P* from *O*, of *A* from *K* ?

3. How many metres is *M* above *E*, *K*, *P*, *N*, *I*, and *D* ? Reduce each answer to nearest foot.

4. What is the meaning of the little triangle south of *K* ?

5. Place a piece of transparent paper over the map, and mark in carefully the dotted contour lines and the stream courses. Leave the land below 1,000 metres white, mark with diagonal lines in pencil the land between 1,000 and 1,100, put crossed pencil lines between 1,100 and 1,200, solid pencil between 1,200 and 1,300, diagonal ink lines between 1,300 and 1,400, crossed ink lines between 1,400 and 1,500, and solid ink over 1,500.

1. Would the point *P* be visible from *A*, from *O*, from *K* ? Would *A* be visible from *F*, from *H*, from *C* ?

2. Describe what you would see facing north from point *G*. (Give direction of river, the nature of the banks, any conspicuous objects.)

3. If you walked from *I* to *J* along the road, would you have to ascend on the whole ? If so, how much ?

What is the distance, roughly, in miles ? Would it be easy to ride all the way on a bicycle, given good conditions ? Would you have to go down hill anywhere ?

4. Describe the nature of the slopes between *E* and *I*. Say whether a walker would have to descend anywhere if he went fairly straight.

5. How many feet does the stream, which joins the river near *G*, have to descend from source to junction ? Is it a swift stream ?

1. Looking along the river from *E*, what features would you see ? Account for the nature of the stream bed ?

2. Make a section on inch paper from *F* to *K*, allowing 2 of an inch for each 100 metres for vertical scale. (Measure off the 100 metre contours and sketch in the intervening slopes.) Will the result be roughly true to nature or not ?



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FIG. 66.

[Mrs. A. Le Blond.]



FIG. 67.—REPRODUCTION MADE WITH THE AUTHORISATION OF THE SWISS TOPOGRAPHICAL SERVICE.

3. The photograph was taken at noon on January 20. An observation gave the altitude of the sun as $23^{\circ}2'$. The declination of the sun, according to Whitaker's Almanack, on that date was $20^{\circ}3'$, i.e. the sun would be $20^{\circ}3'$ higher on the Vernal Equinox. The latitude is thus calculated to be $46\frac{1}{2}^{\circ}$ N. ($90^{\circ} - 23^{\circ}2' - 20^{\circ}3'$). The exact Greenwich time was 11.31 a.m.* Calculate the longitude and find the spot on the map on page 67. Into what great river does the water from the streams in this map eventually flow ?

4. If the stick in the snow were exactly vertical and the snow quite level, what angle at the end of the shadow would be subtended by the stick ? (Imagine a straight line joining the end of the shadow to the top of the stick.)

* Due allowance having been made for the "Equation of Time."

Ordnance Maps.

A On the parallel column there can be seen a reproduction of a portion of an Ordnance map sheet published by the British Government.

Above it is a photograph taken from the main-road bridge over the railway near Defford, looking towards the south-east.

Below the map are some of the most important signs and methods of decoration used in British Ordnance maps. These must be studied carefully and compared with the map.

Survey maps are issued for most parts of the British Isles on the scales of 1 inch to the mile, 6 inches to the mile, 25 inches to the mile, and in the case of town plans, 10½ feet to the mile.

On what scale is this map? (The figures 6, 7, and 8 along the main road going through Eckington represent milestones.)

QUESTIONS AND EXERCISES.

1. At what intervals are the contour lines? What is the difference in feet between the highest and lowest point on the map?
2. Name any parks, orchards, antiquities, commons. What kind of trees are there on the slopes of Bredon Hill?
3. Make a tracing of the map, marking the river and all contours. Leave the ground below 50 feet white, shade in pencil the area between 50 and 200 feet, mark with diagonal lines in ink the area between 200 and 600 feet, with crossed ink lines the area between 600 and 800 feet, in solid ink the area above 800 feet.
4. From the "Cross" at Lower Strensham, how far is it roughly by road to the nearest church, station, telegraph office, road-bridge over the river?
5. Describe the railway line from north to south, saying where there is an embankment, cutting, bridge under or over road or river, station, up or down gradient. How many parishes does it run through?
6. Start north from Eckington Bridge, take first turn to the right, and cross the river by Nafford Mill, and by the easiest route make for a point on the eastern margin of map, one mile south of the north-east corner. Describe what kind of roads or paths you would go along. (First, second, or third class, fenced or not.)

B 1. Locate this river on the map of England (Plate 16). Eckington is in about lat. 52° 4' north and long. 2° 7' west. Give the direction of the stream, and say into what big river it flows.

2. What is the meaning of the peculiarly shaded mark, parallel with the inside of the river curve, south of the railway bridge over the Avon?

3. Go from south to north right along the main road across the middle of the map through Eckington, and mention in order any exact indications of level (either bench marks or contours).

4. Draw a section, on inch paper, diagonally across the map from north-west to south-east corners. Make each 100 ft. = 1/10th of an inch, vertical scale. (Use tracing paper over the map and transfer to the squared paper.)

5. If you rowed up the river, what locks and bridges would you pass in order? Could you cover the entire stretch, at the rate of three miles an hour, under two hours?

C 1. On the outside of the river-bends the contours are near the bank, on the inside much farther away. Can you account for this? (See Fig. 29.)

2. Draw a section along the southern edge of the map, making 100 feet = 1/10th of an inch vertically. How many times, roughly, is the vertical scale exaggerated?

3. Describe the view looking from the top of Defford Church towards Bredon Hill. (Mention whether the churches in the view have spires or towers, whether the railway is single or double, any bridges which are visible, etc.)



FIG. 68.—VIEW LOOKING S. E. FROM DEFFORD RAILWAY BRIDGE.



FIG. 69.

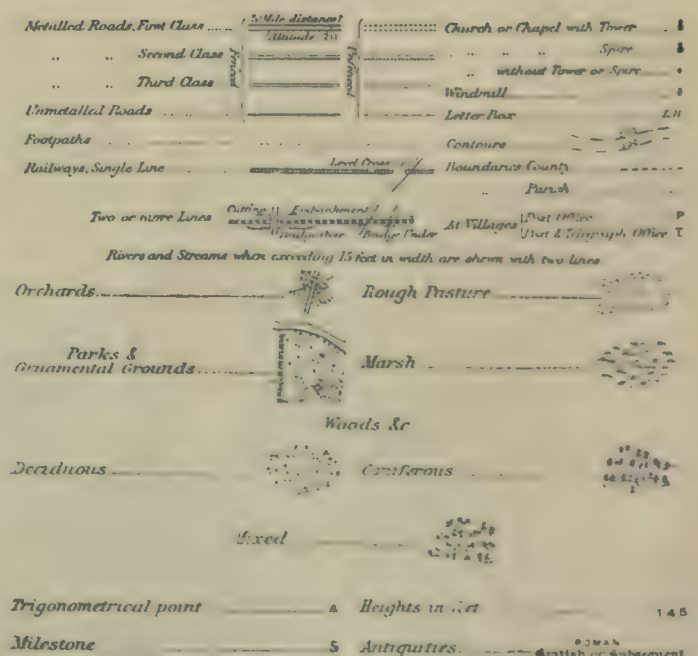


FIG. 70.—CHARACTERISTIC SIGNS USED IN THE SURVEY.

(Figs. 69 and 70 are reproduced from the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office.)

The Polar Regions.

A Even in the present incomplete state of our knowledge, it is possible to make some useful comparisons between the north and south polar areas.

Round the North Pole it is safe to assert that there is a fairly deep sea, with an area nearly equal to that of Australia, almost surrounded by the continents of North America and Eurasia, or the islands which once formed part of them, now resting on their submerged continental shelves. It may be regarded as a great gulf of the North Atlantic, with its entrance partially obstructed by Greenland. Round the South Pole there is a large land area, probably a good deal larger than Australia, surrounded by the great Southern Ocean. While the Arctic Ocean is covered with floe ice, by no means continuous, always moving and generally not more than 15 feet in thickness, with icebergs off the coast of Greenland, the Antarctic continent is probably covered by a huge mantle of ice, several thousand feet thick at least in the interior. This is gradually slipping down and being pushed out to sea, where it breaks off into huge tabular icebergs, which drift far northwards towards the equator. In the north there are three centres of cold, where land areas stretch far northwards, the pole itself being comparatively warm, while over the centre of the Antarctic continent there is probably an area of extraordinary cold.

The seas of both regions are rich in the lower forms of animal life, and also in various kinds of whales and seals; on the land also there are large "rookeries" of birds, chiefly guillemots in the north, penguins in the south. While bears, foxes, reindeer and the musk-ox are fairly well distributed in the Arctic regions, the Antarctic continent seems destitute of land mammals.

History of Polar Exploration.

B King Alfred the Great records the voyage of Othere, the Norseman, round the North Cape to the White Sea. After the discoveries of Columbus and Vasco da Gama about 1500, the theory of a northern sea passage to Eastern Asia led to a long series of heroic attempts, which lasted from the time of Cabot in 1497 to those of Sir John Franklin in 1845 and Baron Nordenskiöld in 1878. The North-West Passage was given up as impracticable after the Franklin disaster; the North-East Passage was accomplished by Nordenskiöld, and proved to be useless commercially.

From about 1650 to 1850 great activity was shown by whalers in the Arctic seas, but the great scarcity of the "right whale," and the fall in value of animal oils, has almost put an end to the industry. These voyages of merchants, however, helped by Government expeditions sent to relieve ships or to investigate fishery questions, led to a wide extension of our knowledge of the North Polar regions.

Since 1840 there have been a series of scientific expeditions towards both poles, some sent by Governments, but most by private enterprise; the most noteworthy being those of Ross in the *Erebus* and *Terror* to the Antarctic continent in 1842, of Nares and Markham north of Greenland in 1875, the various expeditions sent out by the international agreement of 1880, the voyage

which led to the discovery of Franz Josef Land by the Austro-Hungarian party under Payer, the remarkable journey through the Bering Strait by the American de Long, the relics of whose ship *Jeannette* were found off the south-west coast of Greenland. On this fact Nansen's theory of the general drift from Asia to Greenland was based. His specially constructed ship, the *Fram*, after being run into the ice near where the *Jeannette* sank, three years later broke out to the north of Spitzbergen, and Nansen, by leaving the ship during its drift, was enabled to get to within 250 miles of the pole. His observations practically proved the existence of a deep polar sea. After many bold attempts by sledge parties from the Greenland side the North Pole has been reached over the moving ice. The British expedition sent to Victoria Land in 1902 has brought back valuable additions to our knowledge of Antarctica. The Shackleton expedition 1909 reached the South Magnetic Pole on the plateau of Victoria Land, and penetrated to a point within about 100 miles of the S. Geographical Pole, at an altitude of 10,000 feet. Peary in the same year reached the North Pole by a sledge expedition over the sea-ice. No land was met with. Late in 1911, Amundsen led a small party with skis and sledges across the great barrier ice and over the high tableland to the South Pole.

Dates of Polar Discoveries.

B		C	
A.D.		A.D.	
840.	Othere.	Willoughby and Chancellor	
1497.	Cabot's voyage.	1500	Frobisher.
			Davis.
		to	Barents.
		1600	Hudson
			Baffin.
			Bering Strait discovered.
		1806.	Scoresby.
		1827.	Parry.
1650-1850.	Whaling Cruises.	1859.	McClintock.
1842.	Ross.	1882.	Greely.
1845.	Franklin.		Jackson.
		1894.	Andree.
1872.	Payer.		Peary.
1875.	Nares and Markham	1900.	Abruzzi.
1878.	Nordenskiöld.		
1881.	<i>Jeannette</i> sank.	1906.	Peary reached "Farthest North."
1896.	<i>Fram</i> returned.		
1902.	International expeditions to the Antarctic.		
1903.	Scott.		
1909.	Shackleton got within 100 miles of S. Pole.		
1909.	Peary reached N. Pole.		
1911.	Amundsen reached S. Pole		

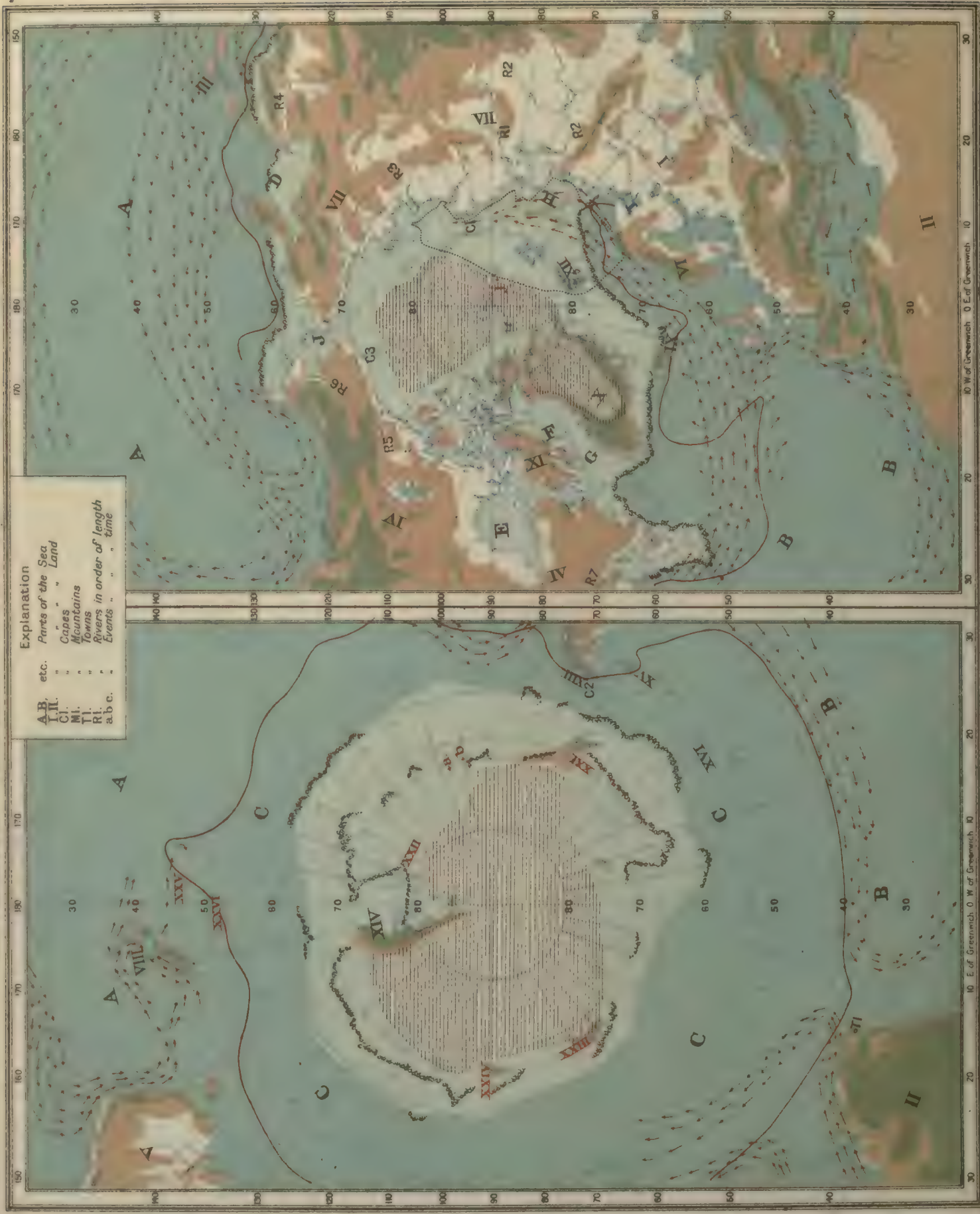
QUESTIONS AND EXERCISES.

- A** 1. The lighter tint of blue shows the area entirely blocked to navigation in winter. Where does permanent open water reach nearest to either pole? and why?
2. What three continents are nearest to the Antarctic continent? Estimate the number of degrees from the south pole to Cape Town, Cape Horn, and New Zealand. Taking 70 miles for each degree, give the distance in each case.
3. What three continents surround the north polar basin? Which of these extends nearest to the north pole?
4. Make a list of all the names printed in brown, with their corresponding symbols in the Test Map.

ARCTIC.



ANTARCTIC. POLAR REGIONS.—Test. ARCTIC.



Lambert's Azimuthal Equivalent Projection

Scale: 1:75,000,000 (1:85 miles = 1 inch)

0 500 1000 Statute Miles

10° W of Greenwich 0° E of Greenwich 10° E of Greenwich

- B** 1. Account for the direction of the red line showing southern limit of floating ice in the North Atlantic. What influence does this have upon navigation between England and America ?
2. Say generally whether the following regions are mountainous or low-lying : Alaska, the shores of Hudson Bay, the north coast of Asia, Greenland, Tierra del Fuego, Victoria Land, South Africa.
3. Write a list of all geographical names in brown and blue, and give their corresponding symbols in the Test Map.
4. Write a list of the various explorers whose names are printed in blue in chronological order, adding after each the degree of latitude reached.

- C** 1. Write a list of all geographical names in brown, blue and red, with their symbols in the Test Map.
2. Write a list of the explorers whose names are printed in blue and red in chronological order, adding after each the degree of latitude reached.
3. In the Antarctic regions the interior edge of floe ice represents its summer limits. What is the lowest latitude reached by winter floe ice in either area ?
4. Why would you expect the south pole to be colder than the north ? Why does the limit of floating ice extend farther from the south pole than the north ? How is its outline determined by ocean currents ?

General Facts on the World Maps.

A On the projection used for the Maps of the World on Plate 8 the comparative areas of the various continents and countries are truly represented, though a good deal of distortion of outline occurs round the edges. It is easy to compare places in similar latitudes, as the parallels are straight lines.

British possessions are indicated by a pink tint or are underlined in red.

The most important political divisions are named, with their capitals, in most cases. The great rivers and chief mountain ranges or peaks in each continent, and the largest areas of inland water, are named. The brown lines, which indicate the general direction of mountain ranges, do not at all adequately represent the surface characteristics. In Central Asia, for example, the great tableland is not indicated, while some comparatively unimportant islands are mentioned, as they do not occur in subsequent maps in their correct relative positions.

In the Test Map (Plate 9) the numbers for countries and towns are arranged according to population ; for rivers, by length ; for mountains, by height ; for oceans, by area.

QUESTIONS AND EXERCISES.

(To be written from the named map, and repeated or re-written from the Test Map.)

- A** 1. Measure the equator in inches, multiply the result by the scale below, and reduce to miles. Will the result give the circumference of the globe ?
2. Measure in inches the meridian of Greenwich. Is this equal to half the circumference of the globe, if worked out by the scale below ? The other meridians are, in reality, the same length, though not so represented on the map. If you measured the distance in inches from London to Tasmania and worked out the result by the scale, would the answer be correct ? Would you get correct answers by thus measuring along lines of latitude ?

3. Write down in order of size the six continents, the three oceans cut by the equator, the four largest islands (not counting Australia).
4. Go right round the coast of North and South America from San Francisco (in the direction in which the hands of a clock move), and write a list in order of all named river mouths, parts of the sea, and capes.
5. Do the same for Eurasia from the Black Sea, for Africa from Cape Town ?
6. To what nation or nations do the following islands belong ? Iceland, Galapagos Islands, Hawaii, Samoan Islands, Tonga, Society Islands, Madagascar, New Guinea, Borneo, Sumatra, Philippines, Fiji, Gilbert Isles, Falkland Isles.
- Write a list of :—
7. The chief British possessions in Africa, and of the British islands off the coast, adding name of chief town in each case, if named in the map.
8. The seven political divisions of Australasia, with chief town in each.
9. The political divisions of Europe, with their capitals.
10. The political divisions of North America, with chief towns named in each.
11. The chief islands in or near the Caribbean Sea.
12. The political divisions of South America, with their capitals, if named in the map.
13. The political divisions of Africa (other than British) with their chief towns, if mentioned.
14. The political divisions on the mainland of Asia, with capitals, if mentioned.
15. The islands off the coast of Asia, with towns. Add in each case to what nation they belong.
16. The chief mountain ranges and peaks mentioned in each continent, with their height to nearest thousand feet, if given in diagram below the map.
- B** 1. Write down in order of population the five most populous political divisions in the world. How many times more populous is the United Kingdom than Belgium, Australia, Natal ?
2. How much more populous is London than Constantinople, Melbourne, Brisbane ?
3. Write down a list of towns which have a population between 700,000 and 500,000 (i.e., notice the numbers between the symbols for Liverpool and Melbourne).
4. Taking the population of Berlin to be 2,000,000, Chicago 1,700,000, Moscow 1,200,000, Calcutta 1,100,000, Madrid 550,000, make a diagram, similar to the one in the Test Map, to show the comparative populations of the cities given.
5. Represent by straight lines drawn on inch paper the comparative lengths of these rivers, allowing $\frac{1}{16}$ th of an inch for each 100 miles : Mississippi (4,200), Amazon (4,100), Nile (3,500), Obi (2,500), Thames (215), Congo (2,900), Rhine (760), Yukon (2,400). (Do not learn their exact lengths.)
- C** 1. Write down in order of length the five longest rivers in the world. Why has the Amazon so much greater a volume than the Nile ?
2. Using the Test Map, write in order the states given in the diagram of Comparative Populations, adding the number of millions in each.
3. From the Test Map, do the same for the cities given.
4. Do the same for the comparative heights of mountains, adding after each the height to the nearest 500 feet.
5. Do the same for the rivers compared by extent of basins.
6. Give four towns within two degrees of lat. 40° N. Also for $23\frac{1}{2}^{\circ}$ N.
7. About what latitude are London, Montreal, Cape Town, Quito, Mouth of the Amazon, Victoria Nyanza, most northerly point of the Antarctic Continent, the North of Norway, Sydney, Singapore, Colombo, Hobart, Cape Horn, Trinidad, St. Petersburg ?
8. What is the difference in time between Greenwich and Cape Town, Colombo, Adelaide, San Francisco, and Fiji ?

REVISION QUESTIONS.

- A**
1. How can you account for the original formation of the earth?
 2. How could you distinguish the origin of certain rocks by looking at them?
 3. Give an account of the formation of Sedimentary Rocks, quoting actual examples.
 4. How do you account for the different arrangements of strata in the photographs on page 4?
 5. Write a description of glaciers, of valley formations, and of the formation of soil.
 6. Explain the origin of various kinds of islands.
 7. Explain how the zones are determined.
 8. Give the causes of the seasons.
 9. Explain, with a diagram, the main "Pressure Belts and Wind Systems."
 10. How are weather maps made?
 11. What are the causes of rainfall?
 12. On what principles are lines of latitude and longitude drawn?
 13. Explain the difficulties of representing large areas of the earth's surface on flat maps. How are these difficulties met?
 14. Explain how map surveys are made. What are contours?
 15. What differences do you notice in the method of contouring on the maps on pages 26 and 27?

- B**
1. Describe the results of volcanic energy upon the earth's crust.
 2. Account for the formation of chalk and flints.
 3. Write accounts of "Erratic Blocks" and of "Ice-scratched stones in moraines."
 4. Draw an imaginary delta, and explain how it may have been formed.

5. How far has the arrangement of land and water on the globe been altered since early geological times?
6. Explain fully the causes of tides.
7. By what methods of observation can the latitude of a place be found?
8. Explain orthographic, cylindrical, and stereographic projections. Can any of these be "equivalent"?
9. Write a short history of Polar exploration.
10. On what scales are the Ordnance maps of the British Isles issued. What scale would be most suitable (1) for a cyclist, (2) for an estate agent, (3) for a town surveyor?

- C**
1. Make an enlarged copy of Fig. 17. Name the lowest layer (No. 5) of rock Silurian, the next (No. 4) Old Red Sandstone, and so on in natural order. Would it be of any use to bore for coal at the fault?
 2. Go fully into the probable causes of the igneous dyke in Fig. 7.
 3. Give a list in order of the chief geological systems. Quote instances of each in the British Isles.
 4. In Fig. 16, if the highest rock layer was Cretaceous, the next Jurassic, and so on downwards, write a list in order (from left to right) of the formations cut by the line which indicates the land surface.
 5. Write an account of the causes of the circulation of water in the Oceans, of their temperature, saltiness and deposits.
 6. What do you know of co-tidal maps?
 7. Give an account of the rainfall near Cape Town and Naples, with reasons for its seasonal distribution.
 8. What is meant by measuring an arc of a meridian, and why is this done?
 9. Explain Mercator's Projection, Gnomonic Projections, and Great Circles.
 10. Write an account, with dates, of North Polar exploration.

B Note on Conditions necessary for Leading Commercial Crops.

Wheat—soil not too light, underground moisture. Rainfall not over 50 inches or under 12. Temperature above 55° for at least three months. In tropics, it must be on high ground: otherwise heat excessive.

Maize—requires a higher summer temperature than wheat, and must have deep rich soil. The United States, and Southern Europe have large areas suitable for it. Latitude limits are between 50° N. and 30° S.

Oats—needs a damp and rather cool climate, and therefore are found especially in N.W. Europe, and the wetter parts of N. America. Not grown in higher latitudes than 65° N.

Barley—will stand more uneven conditions than wheat or oats and has therefore a large range. It ripens earlier than oats, and is grown as far north as 70° in Norway.

Tobacco—does best in a warm moist climate, and prefers a well drained soil, not too heavy. Is grown as far north as Sweden, but is better in tropical or sub-tropical regions.

Sugar-cane—requires great heat and plenty of moisture. Does not usually succeed at more than 35° from the equator.

Rice—most varieties require to be flooded at certain seasons, as well as to be well drained. Not much is grown at more than 40° from the equator.

Potatoes—are very widely grown in all temperate regions, where there is at least fair rainfall. They will flourish on light soil, and can often be grown at a profit where other crops would fail. Hence the great production of northern Germany.

Several European Towns are omitted for want of space. Their names and symbols are: Copenhagen (Denmark) T24, Edinburgh T28, Stockholm (Sweden) T29, Dublin T32, Bucharest (Romania) T33, Belgrade (Serbia) T68, Berne (Switzerland) T60, Sofia (Bulgaria) T61. The

Italy 32

Belgium
7
Australia
3
Natal
1



Mollweide's Homalogram
Scale: 1:100.

Dude-Pest (Hungary) T.12, Liverpool T.H., Brussels (Belgium) T.16, ...
... can be seen on Map of Europe, Plate 23.

International Through Routes by Land & Sea
Principal Submarine Cables

Greater London 65 each sq. = 100,000

New York 38

Paris 28

Constantinople 12

Liverpool 7

Melbourne 5

Montreal 2.5

Brisbane 1

COMPARATIVE POPULATIONS
IN 1903



Rhine 7

Danube 3

Volga 8

Nile 11

Ob 11

Congo 15

Amazon 27 each sq. = 100,000 sq. miles

RIVERS COMPARED BY EXTENT OF BASINS.

The numbers for Countries and Towns are arranged rou

Country N° III
IV
VII
X
XXVI COMPARATIVE POPULATIONS
IN 1903

XXVI
XLVII
LXXIV

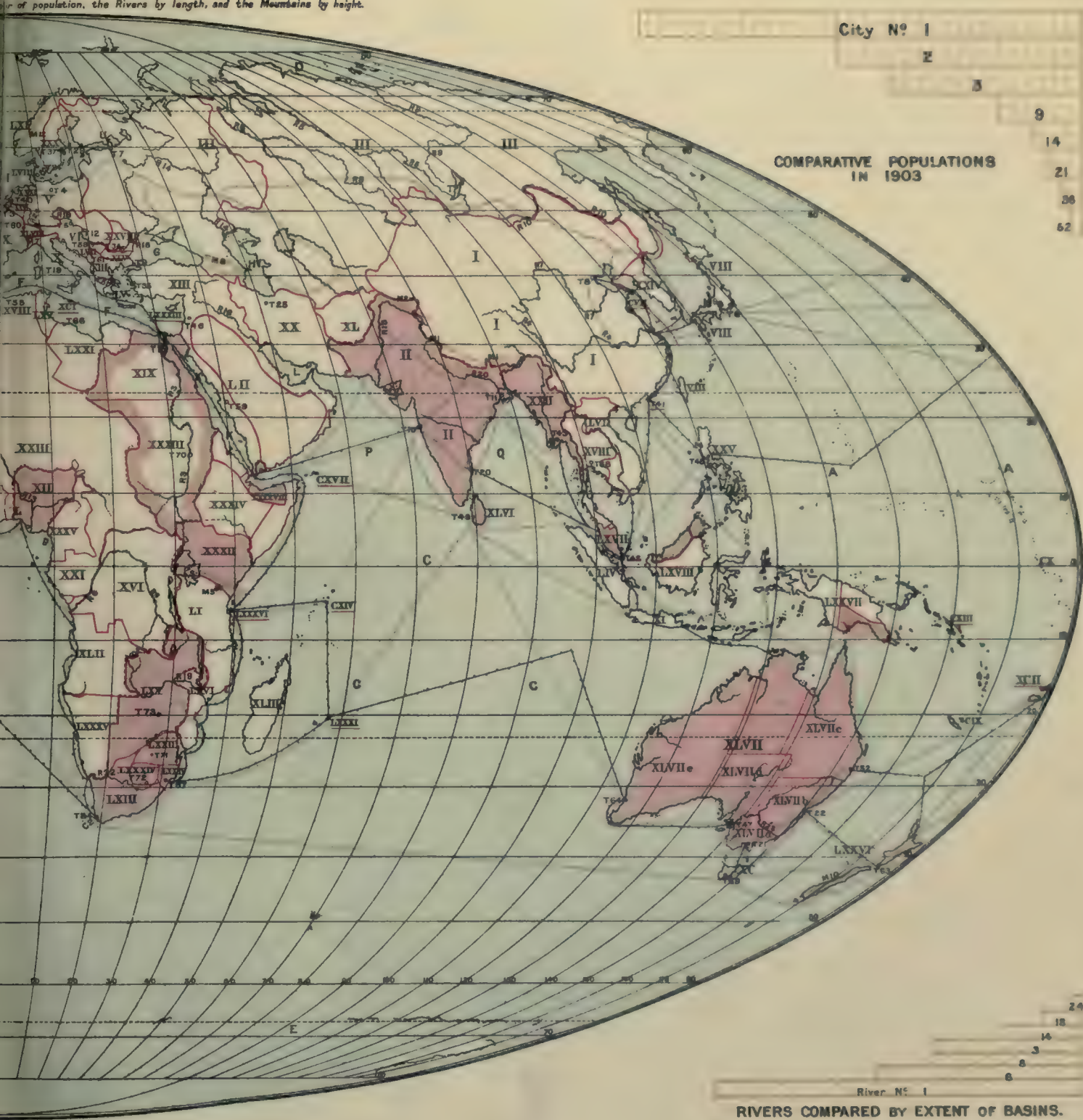


FEET

M1 M3 M4 M5 M6 M7 M10 M11 M12 M14

COMPARATIVE HEIGHTS OF MOUNTAINS

of population, the Rivers by length, and the Mountains by height.



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(Second Term).

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(NOTE.—It is recommended to revise Plates 8 and 9 with the questions on page 29, at the beginning of each term.)

Size, Position in the World.

A The world-map gives a fair idea of the area of the British Isles when compared with those of other countries, though its proper relative position can be realised only from a globe. The diagram below shows how much of Great Britain and Ireland goes to make up 100,000 square miles, out of a total area of something over 120,000 square miles. If 100,000 square miles is taken as a unit, it can easily be compared with the sizes of the continents, which are given in millions of square miles on page 24. In all the maps given further on in the book, this unit of area is given for the sake of comparison. A glance at the separate maps of the continents will show what a very small comparative size the British Isles have.

On the Physical Map the number of miles in a degree of longitude in the latitude of London is given, as well as other distances, which will enable a ready comparison to be made with distances in other maps.

As the distance from the equator determines the amount of heat that any country can receive, it is of importance to notice on the map the comparative

latitude of Great Britain with regard to other parts of the world; though the seasonal variations in temperature are very different among places in the same latitudes.

In Plate 25 it will be noticed that Glasgow, whose July temperature varies less than 20° from that of January, is in the same latitude as Moscow, which has a variation of over 50° between the cold and hot seasons. The Muscovites enjoy several months of skating during the winter, with the heat of Southern Italy in July.

Let us follow the same latitude to the eastern coasts of Asia and N. America, where there is no warm influence from the S.W. advancing over a comparatively warm ocean, and we find ourselves in the frozen sea of Okhotsk or off the icebound coast of Labrador.

QUESTIONS AND EXERCISES.

1. What European cities correspond in latitude to Birmingham and to Land's End (two each)? (See Plate 23.)
2. Compare the latitude of the Orkneys with S. of Greenland, of London with S. of Hudson Bay. (See Plate 8.)
3. Using Plate 8, what is the distance roughly, along a line of latitude, from London to the Volga, to Newfoundland; along a line of longitude (70 miles = 1 degree), to the Equator, to the N. Pole, to the S. Pole.
4. On Plate 8 the comparative areas are fairly correct. Does Ireland look larger than, about equal to, or smaller than Cuba, Ceylon, Borneo? Compare the British Isles similarly with New Guinea, Newfoundland, and Madagascar.
5. Look at the map of the United States (Plate 43). Do you notice that any of the States are bigger than the unit of area? Would the Gulf of Mexico contain the British Isles?
6. On the map of British North America (Plate 63) do any of the provinces of the Dominion of Canada appear smaller than the unit of area?
7. Taking 70 miles for a degree, work out the distance from Cape Horn to the north of S. America (Plate 52), and compare this distance with the 500 miles from London to Wick.
8. Judging from the map of Africa (Plate 54), would Lake Tanganyika reach from Southampton to Berwick? How many times farther is it from Durban to Cairo than from London to Birmingham?



FIG. 71.

Surface Features

Plates 10 and 11 must here be learnt, the Geological Inset Map not till later.

B Following the latitude of Glasgow (56° N.) through Eurasia, we come to the shores of Lake Baikal, whose surface is frozen for many winter months, whilst its summer is hotter than that of Southern France. If we go west across N. America, the western coast of British Columbia will be found to correspond most nearly in climatic conditions, owing to the S.W. warm drift across the Pacific, which gives that coast an annual range of 20° only.

QUESTIONS AND EXERCISES.

1. Using Plate 3, write down the average July and January temperatures, roughly, of Glasgow and Lake Baikal, of the N. of Caspian Sea and London, of Vancouver Island and the S. of Ireland.

2. Explain why the scene below is so different from what can usually be seen in the British Isles at the same season.



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(Mrs. A. Le Blond.

FIG. 72.—WINTER SCENE IN SWITZERLAND.

This view was taken in January near St. Moritz (see map on page 67). What is the latitude? Notice how the mist rising from the stream has formed a thick hoar-frost on the surrounding bushes and trees. Higher up the dryness of the atmosphere prevents this effect. The wires are not telegraph wires, but they carry electricity, made by the natural water power of the country. Nearly every hamlet in Switzerland is thus lighted.

C If the same latitude is followed in the southern hemisphere, Tierra del Fuego is the only land met with. The oceanic conditions around Cape Horn bring an annual range of temperature of less than 20° . While its winter temperature is lower than that of Glasgow, owing to the proximity of the great Antarctic continent, and to the cold current flowing northwards along the west coast of S. America, its summer heat is about equal to it, because at that time (January) the earth is in perihelion. (See p. 14.)

QUESTIONS AND EXERCISES.

1. Compare the British Isles with the Islands of Japan as to latitude and area. Would you expect similar climates and products?

2. Write down as many islands in the World as you can, which are in somewhat similar latitudes as the British Isles.

A The surface features of a country exert so great an influence upon its rainfall, climate, and vegetation that it is of importance to realise them first.

A careful study of the shading of Plate 10 will reveal the arrangement of mountain and plain. The symbols on Plate 11 (P 1, M. 1, etc. will supply a general idea of the relative heights above sea-level of the various peaks and groups of mountains and hills, which are arranged in order of height from Ben Nevis (P 1), with its 4,400 feet, to the East Anglian Heights (M 37), a gentle rise of a few hundred feet only in the surface.

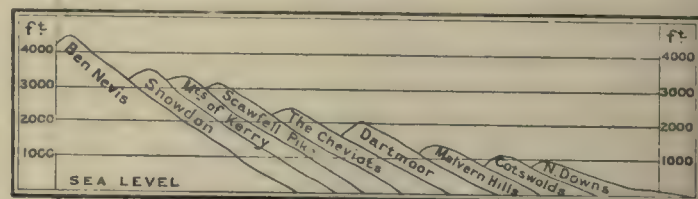


FIG. 73.—COMPARATIVE HEIGHTS OF BRITISH MOUNTAINS.

The length and direction of rivers are, of course, largely determined by the surface features. The first three, by number, in Plate 10 are arranged in order of length, the Shannon, about 250 miles from source to mouth, being the longest in the kingdom. (R1 and R2 ought to be transposed in Map.

QUESTIONS AND EXERCISES.

1. Write a list, with symbols from the Test Map, of the parts of sea, capes, islands, mountains, peaks, rivers, and lakes marked in brown on the Physical Map. Be ready to repeat from Test Map. (M 3 in Ireland ought to be M 13.)

2. In a coasting voyage from the Forth southward and westward to Land's End and then north to the Clyde, what river mouths (marked in brown) would you pass, in order?

3. What are the six highest mountain groups marked on Plate 10? Make a list of them in order of height.

4. Why are the rivers running into the North Sea longer, as a rule, than those which run westwards?

5. Mention two rivers which you would expect to have a rapid course, and two which would probably be navigable for some distance.

B A glance at the comparative depths of the sea round Great Britain shows at once that these islands stand upon a great continental shelf.

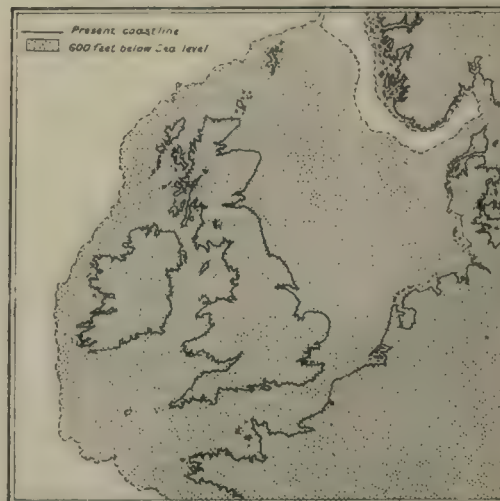
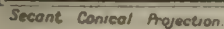


FIG. 74.—COASTLINE, IF THE SEA SANK 600 FEET.

10



Scale: 1: 5,000,000 (79 miles = 1 inch)

Scouty Miles

4. 1900. 1901. 1902. 1903. 1904. 1905. 1906. 1907. 1908. 1909. 1910. 1911. 1912. 1913. 1914. 1915. 1916. 1917. 1918. 1919. 1920. 1921. 1922. 1923. 1924. 1925. 1926. 1927. 1928. 1929. 1930. 1931. 1932. 1933. 1934. 1935. 1936. 1937. 1938. 1939. 1940. 1941. 1942. 1943. 1944. 1945. 1946. 1947. 1948. 1949. 1950. 1951. 1952. 1953. 1954. 1955. 1956. 1957. 1958. 1959. 1960. 1961. 1962. 1963. 1964. 1965. 1966. 1967. 1968. 1969. 1970. 1971. 1972. 1973. 1974. 1975. 1976. 1977. 1978. 1979. 1980. 1981. 1982. 1983. 1984. 1985. 1986. 1987. 1988. 1989. 1990. 1991. 1992. 1993. 1994. 1995. 1996. 1997. 1998. 1999. 2000. 2001. 2002. 2003. 2004. 2005. 2006. 2007. 2008. 2009. 2010. 2011. 2012. 2013. 2014. 2015. 2016. 2017. 2018. 2019. 2020. 2021. 2022. 2023. 2024. 2025. 2026. 2027. 2028. 2029. 2030. 2031. 2032. 2033. 2034. 2035. 2036. 2037. 2038. 2039. 2040. 2041. 2042. 2043. 2044. 2045. 2046. 2047. 2048. 2049. 2050. 2051. 2052. 2053. 2054. 2055. 2056. 2057. 2058. 2059. 2060. 2061. 2062. 2063. 2064. 2065. 2066. 2067. 2068. 2069. 2070. 2071. 2072. 2073. 2074. 2075. 2076. 2077. 2078. 2079. 2080. 2081. 2082. 2083. 2084. 2085. 2086. 2087. 2088. 2089. 2090. 2091. 2092. 2093. 2094. 2095. 2096. 2097. 2098. 2099. 2100. 2101. 2102. 2103. 2104. 2105. 2106. 2107. 2108. 2109. 2110. 2111. 2112. 2113. 2114. 2115. 2116. 2117. 2118. 2119. 2120. 2121. 2122. 2123. 2124. 2125. 2126. 2127. 2128. 2129. 2130. 2131. 2132. 2133. 2134. 2135. 2136. 2137. 2138. 2139. 2140. 2141. 2142. 2143. 2144. 2145. 2146. 2147. 2148. 2149. 2150. 2151. 2152. 2153. 2154. 2155. 2156. 2157. 2158. 2159. 2160. 2161. 2162. 2163. 2164. 2165. 2166. 2167. 2168. 2169. 2170. 2171. 2172. 2173. 2174. 2175. 2176. 2177. 2178. 2179. 2180. 2181. 2182. 2183. 2184. 2185. 2186. 2187. 2188. 2189. 2190. 2191. 2192. 2193. 2194. 2195. 2196. 2197. 2198. 2199. 2200. 2201. 2202. 2203. 2204. 2205. 2206. 2207. 2208. 2209. 2210. 2211. 2212. 2213. 2214. 2215. 2216. 2217. 2218. 2219. 2220. 2221. 2222. 2223. 2224. 2225. 2226. 2227. 2228. 2229. 2230. 2231. 2232. 2233. 2234. 2235. 2236. 2237. 2238. 2239. 2240. 2241. 2242. 2243. 2244. 2245. 2246. 2247. 2248. 2249. 2250. 2251. 2252. 2253. 2254. 2255. 2256. 2257. 2258. 2259. 2260. 2261. 2262. 2263. 2264. 2265. 2266. 2267. 2268. 2269. 2270. 2271. 2272. 2273. 2274. 2275. 2276. 2277. 2278. 2279. 2280. 2281. 2282. 2283. 2284. 2285. 2286. 2287. 2288. 2289. 2290. 2291. 2292. 2293. 2294. 2295. 2296. 2297. 2298. 2299. 2300. 2301. 2302. 2303. 2304. 2305. 2306. 2307. 2308. 2309. 2310. 2311. 2312. 2313. 2314. 2315. 2316. 2317. 2318. 2319. 2320. 2321. 2322. 2323. 2324. 2325. 2326. 2327. 2328. 2329. 2330. 2331. 2332. 2333. 2334. 2335. 2336. 2337. 2338. 2339. 2340. 2341. 2342. 2343. 2344. 2345. 2346. 2347. 2348. 2349. 2350. 2351. 2352. 2353. 2354. 2355. 2356. 2357. 2358. 2359. 2360. 2361. 2362. 2363. 2364. 2365. 2366. 2367. 2368. 2369. 2370. 2371. 2372. 2373. 2374. 2375. 2376. 2377. 2378. 2379. 2380. 2381. 2382. 2383. 2384. 2385. 2386. 2387. 2388. 2389. 2390. 2391. 2392. 2393. 2394. 2395. 2396. 2397. 2398. 2399. 2400. 2401. 2402. 2403. 2404. 2405. 2406. 2407. 2408. 2409. 2410. 2411. 2412. 2413. 2414. 2415. 2416. 2417. 2418. 2419. 2420. 2421. 2422. 2423. 2424. 2425. 2426. 2427. 2428. 2429. 2430. 2431. 2432. 2433. 2434. 2435. 2436. 2437. 2438. 2439. 2440. 2441. 2442. 2443. 2444. 2445. 2446. 2447. 2448. 2449. 2450. 2451. 2452. 2453. 2454. 2455. 2456. 2457. 2458. 2459. 2460. 2461. 2462. 2463. 2464. 2465. 2466. 2467. 2468. 2469. 2470. 2471. 2472. 2473. 2474. 2475. 2476. 2477. 2478. 2479. 2480. 2481. 2482. 2483. 2484. 2485. 2486. 2487. 2488. 2489. 2490. 2491. 2492. 2493. 2494. 2495. 2496. 2497. 2498. 2499. 2500. 2501. 2502. 2503. 2504. 2505. 2506. 2507. 2508. 2509. 2510. 2511. 2512. 2513. 2514. 2515. 2516. 2517. 2518. 2519. 2520. 2521. 2522. 2523. 2524. 2525. 2526. 2527. 2528. 2529. 2530. 2531. 2532. 2533. 2534. 2535. 2536. 2537. 2538. 2539. 2540. 2541. 2542. 2543. 2544. 2545. 2546. 2547. 2548. 2549. 2550. 2551. 2552. 2553. 2554. 2555. 2556. 2557. 2558. 2559. 2560. 2561. 2562. 2563. 2564. 2565. 2566. 2567. 2568. 2569. 2570. 2571. 2572. 2573. 2574. 2575. 2576. 2577. 2578. 2579. 2580. 2581.

BRITISH ISLES.—Physical Fact Map.—Test.



A The coal-fields of N. and S. Wales and of the Lowlands of Scotland belong to a similar geological age, and in each case lie in "Basins" which have escaped the excessive denudation of the surrounding country. Devon and Cornwall, on the other hand, have lost the coal measures, which, probably, once overlay them.

QUESTIONS AND EXERCISES.

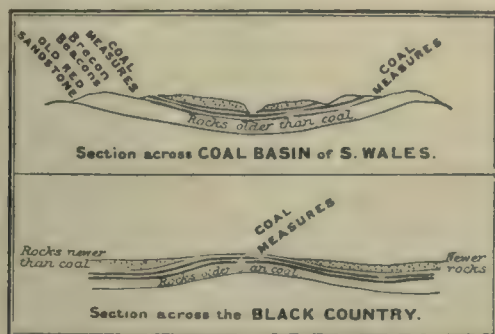
1. Why is coal not found in the Highlands?
2. Make a tracing of the Geological Structural Map and place it over the Population Map on Plate 13, and see what relation coal-fields have to thickly peopled districts.

B S. Wales possesses the most valuable coal-field in the world; and though its output in tons is not the heaviest, its anthracite produces more steam per ton than any other variety, and is therefore highly valued for shipping purposes. The tin of Cornwall, though of very little value now, led to the tin-plate industry of S. Wales, the iron-ore for which is imported chiefly from N. Spain, while the tin-ore now comes largely from the Malay Peninsula.

QUESTIONS.

1. Coal has been found at Dover: through what different kinds of rocks would you expect the shaft to pass before reaching it?
2. What four ports would naturally send out most coal, and from what coal-fields? (About one-quarter of the total output is exported.)
3. Ireland is largely covered with Carboniferous Limestone rocks. Why is so little coal found there?

C When a coal-field lies in a "Basin," which does not necessarily imply low-lying country, it will be noticed that older rocks must encircle it, as in S. Wales and Scotland; while, if it is exposed as the result of an uplift, newer rocks must lie around it, as in S. Stafford and Warwickshire and on either flank of the Pennines. (See diagrams below.)



FIGS. 88 AND 89.

The importance of Geological Faults (see page 6) is well exemplified by the Scottish coal-field: that rich area, having sunk between two parallel faults which divided the Lowlands from the Highlands and Southern Uplands, escaped the denudation which stripped the coal measures from the surrounding country, as it did from Ireland and Devonshire.

The great fault from the Bristol Channel to the Dee, again, serves to make a clear boundary between the natural region of Wales and the Central Plain, though actually many English counties are found west of that limit.

QUESTIONS.

1. Name two English counties, west of this line of fault.
2. Could coal be reached by boring in old red sandstone?

A The Highlands of Scotland, the Lake District, and N. Wales are the remains of a vast system of much older rocks, greatly folded and worn, with many igneous, often volcanic, intrusions amongst them. Thus Snowdon and Scawfell and most of the Lake District peaks, except Skiddaw, owe their heights to the products of old volcanoes. The mountains of Donegal, Mayo and Connemara are a continuation of the Scottish Highlands, the Mourne Mountains of the Southern Uplands. The Isle of Man and the Wicklow group of mountains belong to the same system as the heights of Cumberland and N. Wales. The great central plain of Ireland, composed chiefly of Carboniferous Limestone, is of the same age as the Pennines. With the exception of a few small areas, such as that of Kilkenny, it has been



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[G. P. Abraham, Kenrick]

FIG. 90.—STRIDING EDGE, HELVELLYN.

part of the igneous central mass of the Lake District. The lake in the far distance is Ulleswater.



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[G. P. Abraham, Kenrick]

FIG. 91.—SNOWDON, FROM THE PINNACLES.

Judging from the snow-patches, which is the north, and in what direction was the photographer looking?

stripped of its coal-fields. It is, however, covered, over a great part of its surface, with most extensive bogs, which supply cheap fuel, in the form of peat, to the rural inhabitants.

B It will be noticed that the general trend of ranges and depressions in the British Isles is from N.E. to S.W. The great valley of the Caledonian Canal, the shape of the Lowland Depression, the fiords of W. Scotland and Western Ireland and of Milford Haven, the south-westerly direction of all the headlands on our western shores, may be cited as examples of this tendency.

C In Ireland the tendency of the earth-folds is exactly similar, though in the extreme S.W. their direction becomes almost E. and W. That region, composed of Old Red Sandstone, much folded, with the softer Carboniferous Limestone in the valleys, is a fine example of the influence of geological formation upon surface features. The courses of the Lee and Suir and Blackwater follow the synclines. If these depressions are followed westward they end in the drowned valleys of Kenmare, Dingle and Bantry Bay; while the anticlines run out to sea, to form such well-known landmarks as Mizen Head and Cape Clear.

Distribution of Heat. Weather.

A In the first pages of this section a general comparison was made between the climate of Great Britain and that of other regions in the same latitudes. Local variations must now be investigated.

The results of many years of observation are shown clearly in the accompanying maps. Differences of height above sea-level are, of course, not allowed for. Each rise of 300 feet generally causes the temperature to drop 1° . The apparently curious variations can be accounted for by three great natural causes: the ordinary tendency for isotherms to follow lines of latitude, the strong inflow of wind and ocean currents from the S.W., and the general law that water areas change little in temperature between winter and summer, whilst land areas change much. That is, in winter Europe acts as a great reservoir of cold, and brings much frost to Aberdeenshire and the fen country; whilst in summer its comparatively greater heat causes the warmest areas to be found to the S.E. of the most inland portions of Great Britain. The modifying influence from the S.W. makes the difference in temperature between the winter and summer months but 16° in S.W. Ireland, whereas in Essex the mean annual range goes up to 25° . It is interesting to note that in winter the Orkneys are as warm as the Isle of Wight, whilst in summer Kerry is as cool as Aberdeen. It is easy to see why in August Londoners hasten to the seaside, and why invalids in winter are sent to Tenby (in S. Pembrokeshire) or Torquay.

QUESTIONS AND EXERCISES.

1. What parts of the British Isles have the greatest and least difference in temperature between winter and summer?
2. To what parts would you go to be cool in summer and warm in winter?
3. Explain clearly what is meant by Isobar and Isotherm.

4. Heat and pressure vary according to the height of observatories above sea-level: how is the difficulty got over in making weather maps?

5. Why is rain likely with a falling barometer?

6. If the thermometer stood at 32° on the summit of Ben Nevis, what would you expect it to be at sea-level near its base?

7. Using the Isothermal Maps of Europe (Plate 25), compare the mean January temperature of London, Amsterdam, and Moscow. Do the same in July.

8. Using the Isothermal Maps, on Plate 12, compare Glasgow's January and July temperature with three other places in same latitude in Europe, Asia, and N. America respectively (see Plates 25 and 36).

B The influence of the Irish Sea upon climate is well indicated by the warm gulf that extends northwards in January to Anglesey, and the cool area which reaches Pembrokeshire in July. As the east coast is more bracing than the west, it is not difficult to see why holiday-seekers in summer make for the coolest spots that can easily be reached on that side, and fill the hotels at Scarborough and Cromer.

The narrowness of England between the Solway and the Tyne considerably reduces the range of temperature in Cumberland and Northumberland, whilst its width between S. Wales and Norfolk increases materially the extremes of heat and cold felt at Rugby.

QUESTIONS AND EXERCISES.

1. Trace the July Isotherms over a tracing of the January Isotherm map, and shade in the areas which have the greatest and least annual range.

2. During what parts of the year would east winds be common at Dover? and why?

3. If the earth revolved from east to west instead of from west to east, what would the climate of the British Isles be like? and why?

C Whilst it is easy to make seasonal maps with isothermal lines for the British Isles, it is almost impossible to reduce the variations in pressure to any fixed periods of change. With a permanent area of high pressure in the Atlantic west of the Azores, and of low-pressure off Iceland, with the European averages comparatively high in winter and low in summer, there is almost a constant struggle going on between various winds, the result being that seldom for more than a week at a time is the same weather experienced. The accompanying weather-charts (Plate 12) from the *Times* show how rapidly a change from cyclonic to anticyclonic conditions may take place. The 8th of January, 1903, was an exceptionally mild day in the south of England, while on January 13th there was skating at Oxford, and on the 15th the Thames was frozen across at Maidenhead. On January 9th there was heavy rain in Ulster and a severe snowstorm in the east of Scotland. It is interesting to note the various velocities and directions of the wind.

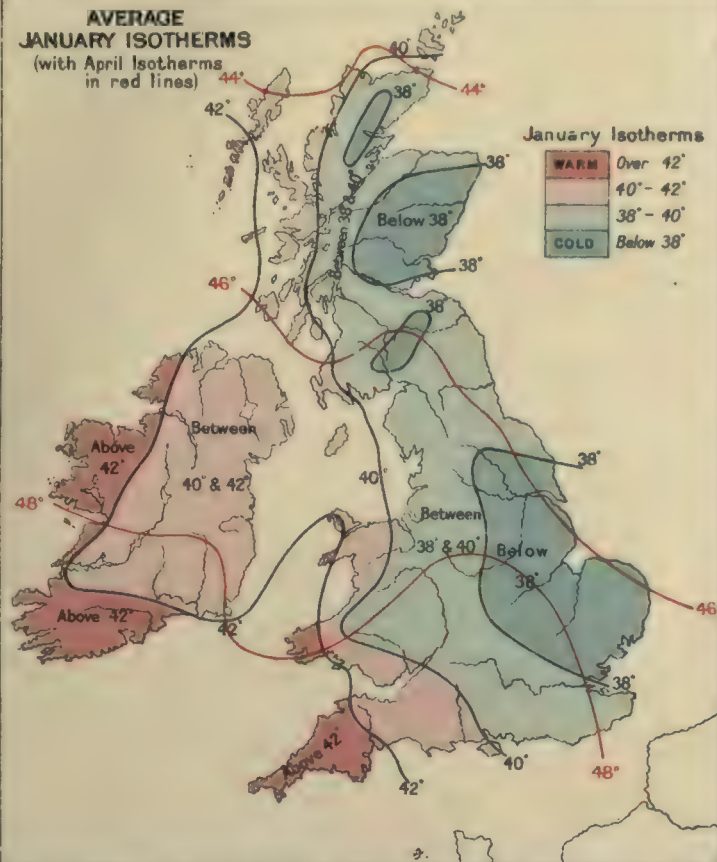
QUESTIONS AND EXERCISES.

1. How would wireless telegraphy be useful in making weather-charts for this area?

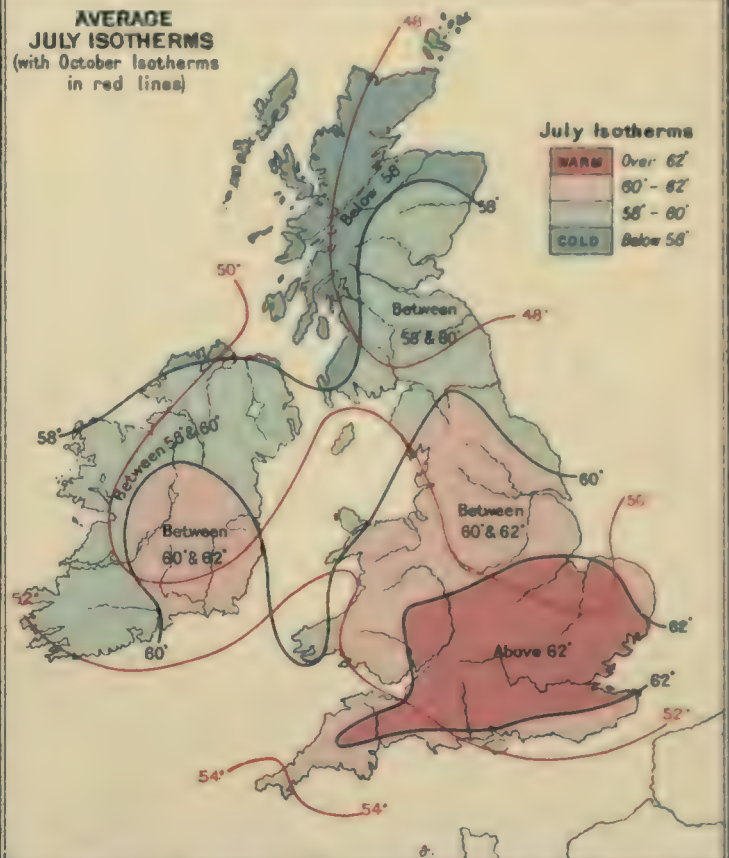
2. Draw a weather chart of the British Isles and North Sea showing a high-pressure area with centre over Denmark, and mark the direction of the winds.

3. Draw an Isotherm map of the British Isles, if it is known that the temperature at Aberdeen is 45° ; London, 50° ; Newcastle-on-Tyne, 43° ; Birmingham, 45° ; Bristol, 48° ; Land's End, 49° ; Dublin, 50° ; Belfast, 50° ; Cape Clear, 52° .

AVERAGE JANUARY ISOOTHERMS (with April Isotherms in red lines)



AVERAGE JULY ISOOTHERMS (with October Isotherms in red lines)



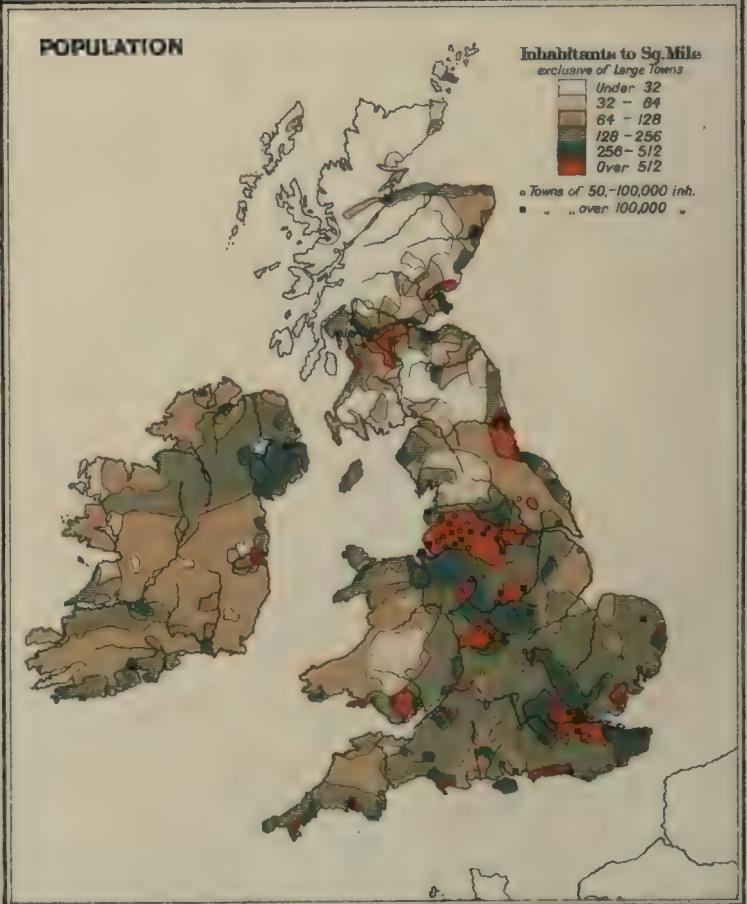
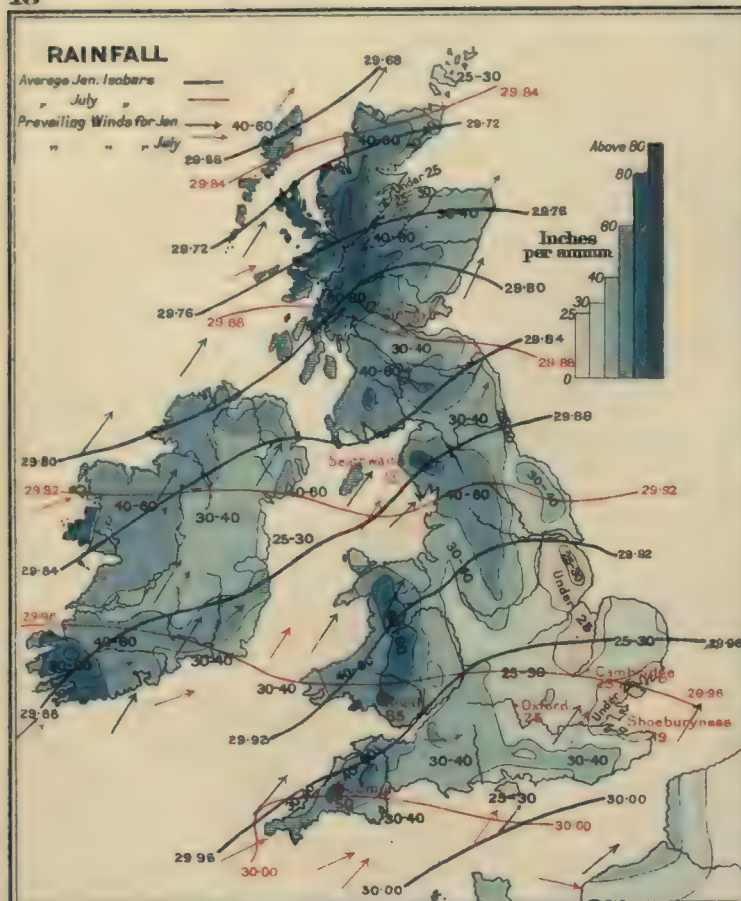
WEATHER CHARTS

JANUARY 9TH 1903



JANUARY 11TH 1903





Rainfall and its Results.

A If it is remembered that usually there is a westerly or south-westerly wind blowing, laden with moisture gathered during its course over the Atlantic, a careful consideration of the Mountain Map will make clear the causes of the distribution of rainfall in these islands. As can be seen in the map, wherever a mountain mass first causes these winds to go upwards and get colder, a heavy annual rainfall is the inevitable result, whilst a low-lying area to the east is, as invariably, comparatively dry. Whilst much rain is necessary for luxuriant grass, it is equally fatal to successful wheat-growing; and so Devonshire and Kerry and Ayrshire naturally produce fine cattle, whilst nine-tenths of the home-grown wheat supply is raised in the Eastern Counties of England.

The areas marked off for particular kinds of agriculture, of course, merge gradually into each other, and in actual experience no such definite lines of contrast are to be found as those shown, of necessity, on the map. Thus cattle and sheep are to be met with almost all over the country, and fields of wheat are not uncommon even in certain parts of Wales or Ireland, but the general impression to be gained from the representation is, in the main, accurate. Upland tracts, being naturally suited for sheep, give rise to the famous breeds from the Cotswolds, Cheviots, Wales, Cumberland and the South Downs. In central and western Ireland the level, ill-drained nature of the country, combined with a copious rainfall, makes large expanses of bog-land of frequent occurrence.

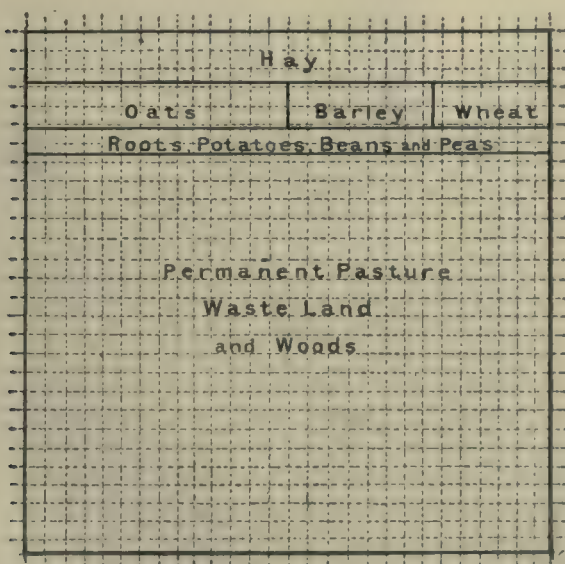


FIG. 92.—PROPORTIONATE AVERAGE OF CHIEF CROPS.

The square equals total area of United Kingdom; each unit = 100,000 acres.

QUESTIONS AND EXERCISES.

1. Make a tracing of the Rainfall Map. Shade in with diagonal lines in ink the land areas with annual rainfall of more than 60 inches, leave areas with less than 30 inches white. Shade the intermediate areas in pencil.

2. Using Plate 5, write down three areas outside Europe with annual rainfall over 80 inches, and three with less than 10 inches.

3. Using Plate 5, say which of these towns have an annual rainfall between 20 and 40 inches, which over 40, which under 20: Calcutta, New York, Madrid, Cairo, Perth (W. Australia), Auckland, Singapore, Peking, Vancouver, Havana, Cape Town, Bombay and Rome.

B The wettest parts of the east coasts of Ireland and England are naturally to be found in the Mourne Mountains and Cleveland district of Yorkshire, while the comparatively flat districts round Milford Haven and the Mersey, though on the western side, naturally escape the heavy rains which are precipitated upon the mountains of Mid-Wales and the Pennines. It will be noticed that the heavy rain patches in Kerry, Glamorganshire, Cumberland and Ross-shire can be reached by lines drawn from the S.W., which scarcely touch land at all, and so naturally the mountain masses there found are the rainiest parts of the British Isles.

QUESTIONS AND EXERCISES.

1. What are the wettest and driest parts of England, Scotland, and Ireland? Give reasons.

2. What rivers in the British Isles would you expect to carry most water, judging from the rainfall in their catchment areas?

3. Why are Suffolk and Lincolnshire good for wheat, Gloucestershire and Cheshire for grazing?

4. What area is most suited to supply Birmingham and London with water? Why does Manchester get its water supply from Cumberland, and Liverpool from N. Wales?

C The combination of a fair average of sunshine and rainfall, with natural advantages of soil and character of the surface, helps to explain the richness of the orchards and hop-yards of Kent and Herefordshire. The low-lying regions of Elgin and Fife, where rain is not too copious, and where there is consequently more sunshine, enable their farmers to grow most of the barley which has made famous the whiskies of the North. The Highlands of Scotland, which lie to the west rather than to the north (parts of Argyllshire are, in fact, south of the north of Northumberland), owing to their elevation have always received abundant moisture; ages ago, no doubt, huge glaciers, resulting from the heavy snow-fall, helped to form the fiords and valleys of the west coast; to-day the same natural features bring full streams, with their abundance of trout and salmon, prevent agriculture, and so provide an ideal home for the red-deer and the grouse. In the future, perhaps, the utilization of the waterfalls for the generation of electrical energy may transform the glens of Inverness into busy centres of industry resembling the valleys of the great coal-field of S. Wales.

QUESTIONS AND EXERCISES.

1. Represent by a graphic curve on squared paper the comparative rainfall of all the stations printed in red on Plate 13.

2. Account for the low rainfall south-west of Liverpool, at Portsmouth, near Inverness; for the high rainfall at Neath, Seathwaite, and Bodmin.

3. What parts of the British Isles would you expect to produce most butter, wheat, fruit, hops, wool? Give reasons.

Railways and Population.

A The diagrams (Fig. 93) show the comparative populations of several great countries. The inhabitants of the United States are increasing very rapidly. In the British Isles and Germany there is a less rapid increase. The population of France is nearly stationary.

A tracing of the railways on transparent paper, placed over the Population Map, shows the connexion between the main lines of communication and the centres of industry. The position of ports determines their extension to the coast.

These are, of course, only some of the main routes. Round Manchester, Leeds and London, and between Glasgow and Edinburgh, there is a complicated network of lines, necessitated by the great population and trade of those districts.

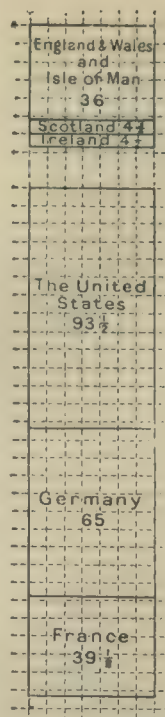


FIG. 93. — POPULATION OF BRITISH ISLES, 1911 CENSUS (TOTAL ABOUT 45½ MILLIONS), COMPARED WITH THAT OF OTHER COUNTRIES.

QUESTIONS AND EXERCISES.

1. Write lists of three great towns on the L. and N.W.R., G.W.R., and G.N.R.
 2. By what three railway companies could you go from London to France, and at what ports would you arrive in each case?
 3. How many towns are there with over 100,000 inhabitants in England, in Wales, in Scotland, in Ireland? (Count the square marks in the Population Map on Plate 13.) What county has most big towns? (See Plate 16.)
- A**
1. In journeys from London to Dublin, Belfast, Wick and Cork, by what lines would you travel?
 2. Ditto from Yarmouth to Plymouth, Grimsby to Liverpool, Edinburgh to Belfast, Dover to Milford?
 3. Trace the outline of the Geological Inset Map on Plate 10. Shade in the coal-fields in black, and place over the Population Map. See how far density of population is caused by the existence of coal.
- B**
1. What facts determined the direction of the three great lines running north from London to Scotland?
 2. Give reasons for the concentration of population round London, Manchester, Glasgow, and Cardiff, for the lack of population in the West of Scotland and Central Wales.
- C**

Geographical Dates.

- A**
- 55 B.C. Julius Caesar made known geography of Britain to civilised world.
 - 827 A.D. Egbert, first King of England.
 - 1066 " Normans landed in England.
 - 1282 " Wales subdued by Edward I.
 - 1603 " Crowns of England and Scotland united.
 - 1707 " Parliaments of England and Scotland united.
 - 1801 " Parliaments of Great Britain and Ireland united.

- B**
- 410 A.D. Romans left.
 - 448 " Angles and Saxons came.
 - 783 " Landing of Danes in England.

- C**
- 789 A.D. Landing of Danes in Ireland.
 - 1171 " Henry II " Lord of Ireland."
 - 1542 " Henry VIII first English " King of Ireland."
 - 1690 " Battle of the Boyne, Ireland finally under English crown.

History and Races.

A The above dates will serve to remind readers of some of the events which have led to the present arrangement of political divisions in the United Kingdom, and to the various sources from which the inhabitants have sprung.

Though a Greek had described the southern coasts of Britain nearly 300 years before the coming of Julius Caesar, it was the information gathered by this great general which led to the Roman occupation nearly 100 years later, the results of which were of such great importance. The remains of Roman towns, roads, camps, walls and villas are to be found throughout Great Britain.

south of the Clyde and Forth. The names on the map bear striking record: -caster, -cester, or -chester = camp, -coln = colony, strat or street = road.

The Roman conquerors had driven to the mountainous regions of Scotland and Wales the previous Celtic inhabitants, whose language still remains in the outlying parts of Great Britain and Ireland. In Wales there are even now about half a million people who can speak only the Welsh language. The names of such natural features as mountains and rivers and plains are very often of Celtic origin (e.g. Avon and Ouse = river, Ben = hill, -dun or -don = fortified height).

When the Romans left, these tribes tried to force their way back again, but found formidable rivals in the fresh invaders from Scandinavia and Germany. It was under



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FIG. 94.—CORACLES AT CARMARTHEN.

Locate the place on the map. What river is this? Coracles consist of basket-work and laths covered with tarred canvas. The ancient Britons probably used similar boats. These men are salmon netters. They work in pairs with a net suspended in the water between them. Notice the method of carrying, the single paddle, the old bridge, and the castle to the left, guarding the bridge, giving a clue to the choice of the site for the town.



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FIG. 95.—THE ROMAN BATHS AT BATH.

In what county is this? The upper part of the building has been restored. Can you distinguish the line where the new masonry begins? The lower stones are the actual ones placed there by the Romans. Before what date must they have been put there? Notice the round Roman arches, which gave the Normans their architectural idea.

the Anglo-Saxons from the latter country that England was first united under Egbert. The Normans who came with William the Conqueror were of Scandinavian origin, but brought with them much of the culture of their home in France. When "by" occurs in a name it is usually of Scandinavian origin. The Angles and Saxons from Germany have given the name to England (Angle-land) itself, and to many of our county divisions (Sussex = South Saxons, etc.), while Norman French is not uncommon in place-names in the south of England and the Midlands.

The various events which led to the union of England, Wales, Scotland and Ireland under one crown and one Parliament may be recalled by the dates given above.

The fusion of these various nationalities into a British people is now almost complete. There are certain characteristics of the average Briton of to-day which distinguish him outwardly from the peoples of Southern and Eastern Europe.



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FIG. 96.—THE TOWER OF LONDON AND THE TOWER BRIDGE.

On the north bank of the Thames. Notice the Norman architecture, the moat, now dry, near the trees. Does the river run from right to left or vice versa?

QUESTIONS AND EXERCISES.

A 1. Give instances of actual names in the United Kingdom which indicate Roman camps, colonies, and roads (1 each), of Keltic names indicating river, hill, and fortified height (1 each), of a Norman French name, of a Scandinavian name.

2. In what parts of the United Kingdom would you expect to find Keltic and Scandinavian place-names? Where would there be no Roman names?

3. In the three pictures above there are features which recall three different races of men. What are these?

4. Owing to what historical causes do the inhabitants of the plains in Great Britain differ from the dwellers in the more mountainous regions?

B 1. Of what various elements is the English language composed? Account for the facts by historical events.

2. How would you know by inspection an ancient Roman road, a Roman camp, a Roman building?

3. Mention three towns on arms of the sea which contain in them the Scandinavian "fiord." 3 which contain the Saxon "ham" (i.e. home), 3 counties which contain the word "Saxon."

4. Loch, Lough, and Llyn = Lake. Haven and Wick = Harbour. Give instances of these words used in place-names.

C 1. By what historical events did the British Isles gradually become the United Kingdom?

2. With what nations would you connect the following place-names:—Formby, Newcastle, Leicester, Canterbury, Chester-le-Street, Cheltenham, Stratford, Anglesey, Berwick, London, and Ben Nevis?

3. How far do racial differences still make difficulties in the government of the United Kingdom?

A The map opposite gives the most important or famous towns, together with some of the chief lines of navigation, inland and oceanic. The inland waterways, which are marked with a thick red line, are navigable for sea-going steamers of considerable size.

It will be noticed that nearly all the great centres of industry that lie fairly close together in flat country are joined by canals suitable for barge traffic. The valleys of the Mersey, Trent, Ouse, Thames and Bristol Avon are thus linked together. The great ship canal from the Mersey to Manchester enables ocean steamers of 7,000 tons to go inland to the greatest centre of population in the world.

In Scotland the Forth and Clyde Canal, and the Caledonian Canal (joining the Firth of Lorne with the Moray Firth) are the most noteworthy. In Ireland the Royal and Grand Canals connect Dublin with the Shannon.

The canals of the United Kingdom do not compare favourably with those of France and North Germany. This is partly due to the fact that railway companies have bought up many of the canals to prevent competition with their routes, but chiefly to the fact that in most cases it is cheaper to send goods round by coasting steamers, which, of course, travel much faster than canal boats. The amount of trade thus carried on between various parts of this country is enormous.

It has only been possible to indicate the leading routes taken by ocean steamers. Plate 20 shows what kind of imports come by various routes.

QUESTIONS AND EXERCISES.

1. Write a list, with symbols, of all the towns named, and be ready to repeat from the Test Map. (There are 71.)
2. On what principle are the towns numbered? Name the five most populous in England, the four most populous in Scotland, the three most populous in Ireland, and the most populous town in Wales.
3. Write a list of the chief ports marked.
4. What rivers are navigable at all by sea-going steamers? What are the two large canals marked?
5. What rivers are joined in the United Kingdom by canals suited for barge traffic? (Find the names of the rivers from Plate 10.)
6. Name four pairs of ferry-towns in England and France, and two routes from England to Ireland.
7. Pick out two great inland towns especially well served by canals. Can you give reasons for this?
8. Though the surface of Ireland is not as a rule difficult for canal making, why are canals not more developed?
9. What natural difficulties are there to canals between Liverpool and Hull? Why have they been so well developed, in spite of these?
10. On or near what rivers are Newcastle, Middlesbrough, Hull, Windsor, Bath, Chester, Liverpool, Carlisle, Glasgow, Aberdeen, Limerick, Dublin, Oxford?
11. To what parts of the world or places are steamer routes marked from the great ports?
12. How many naval stations are marked on this map? Can you give any reasons for the positions in which they are placed?
13. In England and Scotland the great commercial ports are generally on deep indentations, which happen to lie in opposite pairs. Give instances of three such pairs of ports. For somewhat similar reasons there are two important tourist resorts near each end of the Caledonian Canal. What are these?

Industries and Trades.

Use Plate 20

A Just as the agriculture of a country is determined by temperature and rainfall and character of the surface, so its other industries depend largely upon the minerals found beneath the soil (coal and iron being the most important) and the facility of transport by land and sea.

With a climate suited for the white man's toil, and the great external centres of civilisation and trade easily reached, the British Isles, with their abundance of coal close to natural harbours upon the ocean, have almost of necessity become the most important manufacturing country in the world.

The position of the great industrial areas in the British Isles corresponds very nearly with that of the chief coal-fields. Special local causes have led to certain trades being centred at certain towns. Thus the natural supply of wool from the Pennines and the water-power of the tributaries of the Ouse have made West Yorkshire the cheapest place for the production of woollen manufactures. The development of the coal-fields has made Leeds the centre of a large number of great towns occupied in similar industries. The hard grit found near Sheffield, suitable for grindstones, accounts for its great cutlery trade being situated on that part of the coal-field. Hull has naturally become the port for these manufacturing centres, and, reckoning by value of trade, stands third in the kingdom.

The existence of iron-ore and coal, easily reached, in the same district has led to the growth of Glasgow, Belfast, Barrow, Middlesbrough and the towns of South Wales. Iron-ore from Sweden and Spain supplements local supplies. Belfast imports coal cheaply from Scotland; Barrow from Whitehaven. The Swansea district specialises in copper, manufactured from the ores of Spain.

Cornish tin originally determined the tin-plate trade of Newport and Cardiff, though almost all the supply of that metal now comes from Malaysia and Australasia. Great rivers or harbours, safe from storms, have centred the shipbuilding industry round Glasgow, Newcastle and Belfast, with their natural supplies of raw materials. A greater tonnage of ships is often launched from the Clyde in one year than from all the rest of the world.

The district round Manchester, in the centre of the great Lancashire coal-field, with a moist, equable climate especially suited to the spinning of cotton, looking towards the Atlantic across which the bulk of the raw material must come, has naturally become the greatest centre of that industry in the world.

The nearness of the South Staffordshire coal-field, and the natural convenience of Birmingham as a distributing centre, has made possible the growth of the more elaborate forms of steel and iron manufacture (such as small arms, screws and chains), which can bear the cost of transport from that inland district to the coast.







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FIG. 97.—TILBURY DOCKS.

Locate Tilbury on the map. On which bank of the Thames is it? What town is opposite to it? How far is it from "The City"? The view was taken at high tide. Would the water inside the dock remain at a constant level? Could ships enter at low tide? Notice the cranes for loading and unloading vessels, the sheds for storage, the two methods of entering the docks (the steamer in the lock is being towed, the one waiting outside is using her own steam). The river itself can be seen on the left, covered with shipping.

B The suitability of the North of Ireland for the growth of flax makes famous the linen-making towns of Ulster; the salt area of Cheshire (the most valuable of its kind in the world) determines perhaps the chemical manufactories of St. Helens and Widnes; the wool of the Cotswolds, combined with natural water-power, led to the growth of the famous West of England cloth, produced in the upper valleys of the Thames and Bristol Avon (Stroud and Bradford-on-Avon). For the same reasons, in the great sheep areas of Mid-Wales and the Southern Uplands, a similar industry has sprung up on the higher and more rapid parts of the Severn and Tweed (Newtown and Galashiels).

Among the "Other Industries," as shown on Plate 20, the manufacture of leather goods often grows up where there is cheap water- or steam-power near supplies of oak-bark for tanning (as at Northampton); breweries are nearly always found in great centres of population, but especially where there is suitable water, as at Burton, where the springs of the Trent valley with their valuable proportion of sulphate of lime, lie midway between the coal-fields of Notts and Leicestershire.

The close proximity of the hops of Kent and the barley of the home counties no doubt helps the London brewers to compete with those of the Midlands.

C While it would be impossible even to enumerate the vast number of smaller towns which are to be found near the great centres of industry, it may be well to mention a few.

More than half of the cotton goods of the world come from the factories of Lancashire and Lanarkshire. Round Manchester may be noted the cotton towns of Blackburn, Oldham, Preston, Bolton and Wigan; in Scotland, Glasgow and Paisley. Great Britain is also the most important wool-manufacturing country in the world, and round Leeds may be noted such towns as Bradford, Huddersfield, Halifax and Dewsbury, all depending chiefly on that industry. Kendal, Welshpool, Stirling, Kilmarnock,

Kidderminster and Leicester, among hosts of others, are famous for various products of the same description.

Dundee has the largest jute works in the kingdom, in which trade Belfast and London have a share.

Most of the manufactured silk used in England comes from France; but Bradford, Macclesfield, Derby and Norwich have a share in the production.

Among iron-manufacturing towns there should be mentioned, besides the great ones already noticed, Workington in Cumberland; Dudley, Walsall, Wednesbury and Wolverhampton in the "Black Country"; Airdrie and Coatbridge in Lanarkshire; Llanelli, Neath and Newport in South Wales.

Shipbuilding is perhaps the most distinctive of British trades. In 1901, of all the merchant shipping, reckoned by tonnage, launched throughout the world, British yards supplied twenty-five times as much as all foreign countries together. In the huge Clyde trade, Greenock and Dumbarton come next to Glasgow; Jarrow, South Shields and Sunderland share that of the Tyne and Wear district with Newcastle. Darlington, Stockton, the Hartlepoons and Middlesbrough are the chief centres on or near the Tees. Belfast and Londonderry, Liverpool and Birkenhead, Barrow and the lower banks of the Thames follow next in order of importance. In most of these towns private yards turn out ships for the Navy, and supplement the work done at the great government dockyards of Portsmouth, Devonport, Chatham, Sheerness and Pembroke.

The potteries of North Staffordshire, centred at Burslem, Stoke and Hanley, import much of their clay from South Devon and Dorset.

Alkalies for glass and soap, sulphuric acid and various dyes are the most important chemical products of such places as Widnes, Glasgow, Newcastle and Swansea.

Alfa (esparto) grass from Spain and Algeria helps to feed the paper mills of Lancashire, Herts and Kent; though the wood-pulp from the Baltic is a more important kind of raw material.



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FIG. 98.—THE ENTRANCE TO PORTSMOUTH HARBOUR.

Looking from the west side towards the old port of Portsmouth. The sea outside is Spithead. What island protects Spithead from the open sea? What is the western entrance called? Notice the *St. Vincent*, a ship of Nelson's time. The curious vessel going out is a steam dredger; the ferry-boat in the foreground is fitted for taking carriages across the harbour. The great dockyard is further in to the left.

England.

A In the map opposite the names of towns in brown have been placed in brackets and are not made conspicuous, as they have been previously learnt. Only in the Inset Map are there fresh brown names to learn. Nearly all steamer routes have been omitted, as these are dealt with elsewhere.

Where there is red vertical ruling to indicate "iron-ore," it means that in these districts iron-ore is treated and used in the manufacture of pig-iron and steel. In many cases the ore is supplemented from abroad.

The port signs in some cases do not obviously refer to their port: in the Solent the sign refers to Southampton; off the Tyne and Humber to groups of ports.

The naval dockyards near the mouth of the Thames are Chatham and Sheerness.

In the Inset Map of the London district, London county is shown. Greater London, as a city, extends far beyond these borders, especially to the north and east, as is indicated by the numerous towns marked in red, which are really part of Greater London. London county is subdivided into boroughs, three of which are here marked. "The City" is treated separately. The boroughs are differently made up for parliamentary purposes and for the purposes of the London County Council.

QUESTIONS AND EXERCISES.

- A**
 1. Write a list of the chief ports in England and Wales marked in brown, and say what their chief trades are.
 2. Write a list of the chief ship-building towns; which of these are naval ports as well?
 3. Write a list, with symbols, of the towns in the Inset Map, marked in brown. By what counties is London county bounded?
 4. What ports owe much of their activity to their nearness to coal-fields? (See Inset Map on Plate 10.)
 5. Write a list of all towns marked in brown, saying in what counties they are.
- B**
 1. Write a list, with symbols, of all towns marked in blue. Be ready to repeat from Test Map.
 2. Take the rivers in order from Berwick southwards, and so on round the coasts of England and Wales, and name all the towns, marked in brown or blue, which lie on each. Get the name of the rivers from the Physical Map (Plate 10). Neglect those not marked and those named in red on Plate 10.
 3. What mountains or hills lie near Gloucester, Kendal, Macclesfield, Taunton, Exeter, Maidstone, Brighton?
- C**
 1. Write a list, with symbols, of all the towns named in blue or red, in the map of England and Wales, adding the county in which each lies. Be ready to repeat from Test Map.
 2. Repeat this for the Inset Map.
 3. Write down the towns which owe much of their importance to iron and steel manufacture. Make a separate list of the ship-building towns.
 4. Take the rivers in order (as under B, question 2), and name all the towns marked on each from the sea to the source.
 5. What are the two routes marked in this map from South Wales to the south of Ireland?

ENGLAND & WALES.

10



Secant Conical Projection

Scale 1:3,000,000 (48 miles = 1 inch)

100 Statute Miles

ENGLAND & WALES.—Test.



The British Isles. Counties.

Administrative Counties (in order of Population).

| A | | B | | C | |
|--|-----------------------|--|-----------------------|---|-----------------------|
| ENGLAND AND WALES
(becomes B in Scotland
and Ireland). | | SCOTLAND
(becomes A in
Scotland, C in
Ireland). | | IRELAND
(becomes A in
Ireland, C in
Scotland). | |
| | Pop. in
thousands. | | Pop. in
thousands. | | Pop. in
thousands. |
| 1 London . . . | [4,537] | 55 Tyrone . . . | [151] | | |
| 2 Lancashire . . . | [4,387] | 56 Limerick . . . | [146] | | |
| 3 Yorkshire (a) West | | 57 Londonderry . . . | [144] | | |
| Riding (b) East | | 58 Stirling . . . | [142] | | |
| R. (c) North R. | [3,591] | 59 Carmarthenshire . . . | [135] | | |
| 4 Lanarkshire . . . | [1,339] | 60 Denbighshire . . . | [132] | | |
| 5 Staffordshire . . . | [1,237] | 61 Carnarvonshire . . . | [126] | | |
| 6 Durham . . . | [1,187] | 62 Armagh . . . | [125] | | |
| 7 Essex . . . | [1,084] | 63 Perthshire . . . | [123] | | |
| 8 Kent . . . | [961] | 64 Herefordshire . . . | [114] | | |
| 9 Warwickshire . . . | [940] | 65 Dumbartonshire . . . | [114] | | |
| 10 Glamorganshire . . . | [860] | 66 Clare . . . | [112] | | |
| 11 Cheshire . . . | [827] | 67 Wexford . . . | [104] | | |
| 12 Hampshire (includ- | | 68 Roscommon . . . | [102] | | |
| ing I. of Wight) | [799] | 69 Cavan . . . | [98] | | |
| 13 Middlesex . . . | [792] | 70 Inverness-shire . . . | [90] | | |
| 14 Gloucestershire . . . | [708] | 71 Pembrokeshire . . . | [88] | | |
| 15 Devonshire . . . | [682] | 72 Waterford . . . | [87] | | |
| 16 Surrey . . . | [654] | 73 Sligo . . . | [84] | | |
| 17 Derbyshire . . . | [611] | 74 Flintshire . . . | [81] | | |
| 18 Northumberland . . . | [603] | 75 Kilkenny . . . | [79] | | |
| 19 Sussex (a) East (b) | | 76 Ross & Cromarty . . . | [76] | | |
| West . . . | [602] | 77 Monaghan . . . | [76] | | |
| 20 Antrim . . . | [545] | 78 Argyllshire . . . | [74] | | |
| 21 Nottinghamshire . . . | [514] | 79 Dumfriesshire . . . | [73] | | |
| 22 Lincoln including (a) | | 80 Leitrim . . . | [69] | | |
| Lindsey (b) Kest- | | 81 Meath . . . | [67] | | |
| even (c) Holland | [500] | 82 Louth . . . | [66] | | |
| 23 Edinburgh . . . | [489] | 83 Linlithgow . . . | [66] | | |
| 24 Norfolk . . . | [477] | 84 Fermanagh . . . | [65] | | |
| 25 Worcestershire . . . | [454] | 85 Westmorland . . . | [64] | | |
| 26 Dublin . . . | [448] | 86 Kildare . . . | [64] | | |
| 27 Leicestershire . . . | [437] | 87 West Meath . . . | [62] | | |
| 28 Somersetshire . . . | [435] | 88 Banffshire . . . | [61] | | |
| 29 Cork . . . | [405] | 89 Cardiganshire . . . | [61] | | |
| 30 Suffolk (a) East | | 90 Wicklow . . . | [61] | | |
| (b) West . . . | [373] | 91 King's County . . . | [60] | | |
| 31 Northamptonshire . . . | [336] | 92 Queen's County . . . | [57] | | |
| 32 Cornwall . . . | [322] | 93 Montgomeryshire . . . | [55] | | |
| 33 Aberdeenshire . . . | [304] | 94 Breconshire . . . | [54] | | |
| 34 Monmouthshire . . . | [298] | 95 Huntingdonshire . . . | [54] | | |
| 35 Forfarshire . . . | [284] | 96 Anglesey . . . | [51] | | |
| 36 Wiltshire . . . | [271] | 97 Merioneth . . . | [49] | | |
| 37 Renfrewshire . . . | [269] | 98 Roxburgh . . . | [49] | | |
| 38 Cumberland . . . | [267] | 99 Longford . . . | [47] | | |
| 39 Hertfordshire . . . | [258] | 100 Elgin . . . | [45] | | |
| 40 Ayrshire . . . | [254] | 101 Kincardine . . . | [41] | | |
| 41 Berkshire . . . | [253] | 102 Kirkcudbright . . . | [39] | | |
| 42 Shropshire . . . | [240] | 103 Haddington . . . | [39] | | |
| 43 Fife . . . | [219] | 104 Carlow . . . | [38] | | |
| 44 Down . . . | [206] | 105 Caithness . . . | [34] | | |
| 45 Dorsetshire . . . | [202] | 106 Wigtown . . . | [33] | | |
| 46 Mayo . . . | [199] | 107 Clackmannan . . . | [32] | | |
| 47 Buckinghamshire . . . | [197] | 108 Berwick . . . | [31] | | |
| 48 Galway . . . | [193] | 109 Orkney . . . | [29] | | |
| 49 Oxfordshire . . . | [186] | 110 Shetland . . . | [29] | | |
| 50 Cambridgeshire | | 111 Selkirk . . . | [23] | | |
| (including I. of | | 112 Radnorshire . . . | [23] | | |
| Ely) . . . | [185] | 113 Sutherlandshire . . . | [21] | | |
| 51 Donegal . . . | [174] | 114 Rutland . . . | [20] | | |
| 52 Bedfordshire . . . | [172] | 115 Bute . . . | [19] | | |
| 53 Kerry . . . | [166] | 116 Peebles . . . | [15] | | |
| 54 Tipperary . . . | [160] | 117 Nairn . . . | [9] | | |
| | | 118 Kinross . . . | [7] | | |

A

For purposes of comparison and reference the administrative counties of the British Isles are here printed, by order of population. The administrative counties, formed for purposes of local government, do not exactly correspond with the old counties. Boundaries have been simplified, and counties have often been sub-divided (such as Hampshire, Sussex, Lincoln). These divisions are usually indicated. The population of boroughs has been added to the population of the counties to which they belong, although for local government purposes they are treated separately. The divisions of England and Wales are put to the left of each column, of Scotland more to the right, of Ireland most to the right. Thus London is the most populous county of England and Wales, Lanark of Scotland, and Antrim of Ireland. The actual numbers are given for reference only, and must not be learnt.

According to the last census, London county had a population of rather more than $4\frac{1}{2}$ millions. How is it that Greater London had a population of about $6\frac{1}{2}$ millions?

It will be seen that Kent is the first county with less than one million; Edinburgh the first with less than 500,000; Cavan the first with less than 100,000; Merioneth the first with less than 50,000; while the last four have under 20,000 inhabitants.

EXERCISES AND QUESTIONS.

(In schools in Scotland and Ireland the sections must be altered as directed.)

A

1. Trace the outline of the coast from Plate 16. Mark in all the county divisions of England and Wales, number (but do not name) them according to the list on the previous page, and bring up the result as a Test Map. Divide off by thicker lines into groups the six northern counties, the counties of Wales in two groups, making Cardigan and Radnor the two most northerly of the southern group; the six western English counties bordering Wales, including Gloucester and Somerset; the nine southern counties along the south coast and the remaining ones south of the Thames; the five eastern counties including Cambridge; the six north-west midland counties (i.e. Derby, Notts, Stafford, Leicester, Warwick, Worcester), and the eight south-east midland counties (i.e. all the remainder). Learn by groups.

2. How many counties are there (a) in England, (b) in Wales? How many English counties have more than 1,000,000 people? How many less than 50,000?

3. Name the most and least populous county in Wales; the largest and smallest in area in England (see Plate 16). Name the Welsh counties which have a population of more than 50,000.

4. Through what counties does the L. and N.W. Railway run between London and Carlisle; the G.W.R. between London and Milford?

5. What counties would be passed in order by a coasting vessel from the Tyne to Southampton?

6. What English counties border Wales and Scotland?

7. Name the counties traversed by the Thames and Severn.

B

(The older names often remain for parts of Scotland; West, East, and Mid Lothian being often applied to Linlithgow, Haddington, and Edinburgh; just as Elgin is frequently referred to as Moray. Argyll, Perth, the western part of Aberdeenshire and all counties to the north-west of these are reckoned as the Highlands, the rest as the Lowlands.)

1. Trace the outline of Scotland from Plate 18. Mark in all its county divisions, number them according to the list, and use the result as a Test Map.

2. How many counties are there in Scotland? How many of these counties have more than 100,000 inhabitants? Which is the most populous?

3. Name the counties in Scotland which do not reach the sea, and in order from north to south the counties on the East Coast.

4. Name the most northerly, southerly, easterly and westerly, of the counties of Scotland.

5. Name a county in the Highlands, part of which is farther south than the north of Northumberland.

C 1. Trace the Map of Ireland on Plate 18, putting in county boundaries. (Mark the boundaries of the four Provinces by thicker lines.) Number them by list, and use the result as a Test Map.

2. How many Irish counties are there? How many of these have more than 100,000 inhabitants? Name the three most populous.

3. Write lists in order of population of the counties of Ulster, Munster, Leinster, and Connaught.

4. Give in order the counties which would be passed by a coasting vessel sailing right round Ireland, starting from Dublin southwards.

5. Name the most northerly county of Ireland, the most southerly, the most easterly, the most westerly.

6. Name the counties of Ireland which have no sea coast.

7. Between what counties does the Shannon help to form the boundary?

B The Channel Islands (see Plate 28) and the Isle of Man are both more or less self-governing, with laws and privileges of their own. Of the 100,000 inhabitants of the former the majority speak French, and are Normans by descent, as these islands were originally part of William the Conqueror's possessions. They have a typical oceanic climate, and being considerably farther south than any part of England, are able to carry on a lucrative export of early fruit and vegetables for the London market.

The 50,000 inhabitants of the Isle of Man are mostly of Keltic origin. The Manx language, still kept up, is a strong proof of this fact. Their island, chiefly mountainous, is well suited in many parts for grazing, and contains some lead-mines which can be worked at a profit.

B 6. Would you expect snow and frost to be rare in the Channel Islands? Compare their latitude with that of the south of Manitoba, and account for the difference in the winter climates of these two regions.

7. Mention counties in the British Isles with about the same population as that of the Isle of Man and the Channel Islands respectively. Why are the latter so much more densely peopled than the former, although less in area?

8. What language would you expect to predominate in the physical names of (a) Inverness-shire, (b) the Isle of Man, (c) the Channel Islands, (d) Kent, (e) the west of Ireland? Give historical reasons.

C 8. Name a town in the Isle of Man. What county in England, Ireland and Scotland is nearest to it? Which part of the Island is least mountainous. From what town in North Lancashire would you expect to find a line of steamers to the Isle of Man?

9. Name (from Plate 28) the chief Islands in the Channel Isles. Give their approximate latitude and compare it with the Lizard. What large French port is nearest to them? How far, roughly, is the nearest point in France to the nearest island?

10. In what parts of the British Isles is English not spoken? Account for this historically.

11. Why are there regular lines of steamers from Weymouth and Southampton to the Channel Isles and not from the nearer ports of Torquay or Plymouth. Calculate the distance from Southampton to Guernsey and say how long a steamer would take at 20 miles an hour to traverse the distance.

Scotland and Ireland.

A Most of the important facts in relation to these two units of the British Isles have been indicated in the foregoing pages. The maps opposite, on the same scale as England and Wales, serve to show the county divisions, some of the less populous towns, and the position of the chief iron-manufacturing and ship-building centres.

The following short summary will concentrate much of what has previously been learnt. Structurally Scotland may be divided into three parts. (1) The Highlands, consisting of most of the land north-west of a line running from Glasgow to Aberdeen. With the exception of some low-lying and fertile country in Aberdeenshire, Banff, and Elgin (which is not strictly counted as Highlands), this region is mainly made up of high ground, rocky or heather-covered, admirably suited for grouse and red-deer, and therefore largely used for sporting purposes. There are hardly any manufactures within this region; sheep-rearing and fishing being the chief occupations of the working inhabitants.

(2) The Central Plain, a well-marked coal-bearing depression between the Firths of Clyde and Tay, containing a very large proportion of the population of Scotland, as the result of its natural fertility and mineral wealth. (See the Geological Structure Map in Plate 10.)

(3) The Southern Uplands between the central plain and England, consisting generally of older sedimentary rocks, folded and denuded over more than half the area into hills of considerable height, well suited for sheep and grouse. There is a considerable proportion of valuable cattle country to the south-west, and a rich grain district along the lower Tweed.

Ireland, when looked at in the map, has obviously a great Central Lowland stretching right across the country from coast to coast. Over this area the rock is generally Carboniferous Limestone, which is only just older than the coal measures. As the rest of Ireland is made up of still older rocks, it has no large supplies of coal, and cannot be a great manufacturing country. Its oceanic position ensures plentiful rain and mild winters, and makes much of the country well suited for the rearing of cattle and horses.

In the glacial period the central lowland was covered with the remains of various glaciers, and hence is often ill-drained and covered with large tracts of bog, the result of vegetation growing in shallow lakes, which have eventually been choked up. Though useless for agriculture, these beds of peat supply valuable fuel to the inhabitants.

The mountainous parts can be divided into two very different regions.

(1) The south-westerly ranges in Munster are made up of ridges of Old Red Sandstone and Limestone, with valleys running east and west, often fertile and famous for cattle and dairy-produce.

(2) The remaining, chiefly coastal, series of the other three provinces, are made up of the granitic ranges of the east coast in Wicklow and County Down; the basalts of Antrim, and the very ancient and often barren ranges that appear along the north-west coast from Londonderry

SCOTLAND & IRELAND.



SCOTLAND & IRELAND.—Test.

19



to Western Galway. It is in this last region that there is to be found much rural distress, caused largely by the natural thinness of the soil, which can produce little else than potatoes. The iron-ores enclosed within the basalt of Antrim no doubt have led to the growth of the great ship-building of Belfast, which can cheaply import coal from the opposite coast of Scotland.

Notes on Towns, etc.

B Greenock shares with Glasgow much of the Clyde ship-building and foreign trade.

Paisley is in the same great manufacturing district, and is especially busy in cotton manufacture.

Kilmarnock is the centre of the iron and woollen manufactures of the Ayrshire coal-field, to which the town of Ayr acts as the port.

Stirling is the natural place for roads to cross the Forth, and guards the easy gap which leads northwards to the Highlands. At it, or near, many of the chief battles in Scottish history have taken place.

At the point where the naval station (Rosyth) is marked on the Forth there is a remarkable bridge by means of which an easy route is secured from Edinburgh up the east coast, via the Tay Bridge and Dundee. Before this was built the main route went via Stirling.

Selkirk is named as a typical wool-manufacturing town in a country of natural sheep pastures, with water-power available. The great manufacturing towns of the West Riding owe their origin to similar conditions.

Forfar is the natural centre for the rich agricultural region known as Strathmore, the great tract of lowland running diagonally from the Tay Valley near Perth to the coast in Kincardine. Nearly all the small seaport towns in the northern half of Scotland, such as Wick, Stornoway, Lerwick, Kirkwall, and Peterhead, owe their prosperity to sea fisheries, the herring being the most valuable species. The latter town is the starting-place for sealers and whalers for the coasts of Greenland and the Arctic.

Waterford and Wexford have a similar trade to that of Cork in cattle and dairy produce, shipped chiefly to Bristol, Liverpool, and Milford.

Queenstown, on an island in Cork Harbour, is the port of call for American liners for mail purposes; it is the only convenient harbour sufficiently deep and safe for these vessels.

The Lakes of Killarney are the natural tourist centre for the beautiful scenery of Kerry.

Bantry Bay is a natural rendezvous for a fleet operating in the Atlantic.

Most of the small towns in the eastern half of Ulster owe their importance to the linen industry, based on home-grown flax.

Sligo is the natural port of the north-west, and is a fishing town.

In the south-east Rosslare has just been made into an important packet station. The distance across to Goodwick (Fishguard) in Pembrokeshire is less than that from Kingstown to Holyhead. When the necessary railway connexions are complete, the American mails will probably go by this route from London to Cork.

QUESTIONS AND EXERCISES.

- A** 1. Write a list of all the towns marked in brown, saying in what county each is.
2. Name two towns marked as having a great ship-building trade. Can you give any circumstances which have caused this industry to be centred at those places?
3. Into what natural divisions can Scotland be divided? Nearly all the great towns of Scotland are on or near the sea. Why is this?
4. Look at the Agriculture Map of the British Isles (on Plate 13), and mention the chief vegetable products of Scotland and Ireland. Account for their distribution by climatic and structural causes.
5. Why are there so few manufactures in Ireland? What effect does this have upon the growth of population?
6. Trace the Map of Scotland, marking the chief river courses. Shade in pencil all land over 1,200 feet. Put in all the brown symbols from the Test Map (Plate 11), and be prepared to give names to them in class.
7. Do the same for Ireland.

- B** 1. Write a list, with symbols, of all towns and lakes named in brown and blue. Say in what county each is. Be ready to repeat from Test Map.
2. Account, as fully as you can, for the importance of Glasgow, Belfast, Dublin, and Dundee.
3. Trace the outline of Scotland and its islands, marking the chief rivers. Shade in pencil the parts over 1,200 feet. Place in their proper positions the symbols in brown or blue from Plate 11, and be prepared to give names to these in class.
4. Do the same for Ireland.
5. Look at the Population Map on Plate 13, and account for the distribution of population in Scotland and Ireland.

- C** 1. Write a list, with symbols, of all the towns and lakes named in brown, blue and red. Say in what county each town is, and be ready to repeat from the Test Map.
2. Trace the outline of Scotland and its islands, marking in the river courses. Shade in pencil the parts over 1,200 feet. Add, instead of names, all the symbols from Plate 11, and be ready to name these in class. Also insert in ink (red if possible) the chief railway lines from Plate 13, and notice how they avoid high ground as far as they can.
3. Do the same for Ireland.
4. What is the steamer-route marked between Scotland and Ireland (Plate 14)? Why has not the shortest crossing been chosen, namely from the Mull of Kintyre to Antrim?



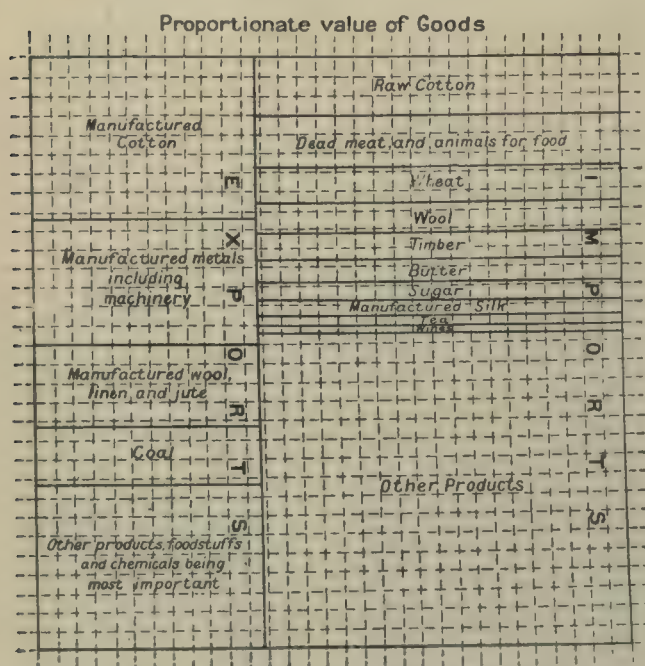
FIG. 99.—A WOOD IN ABERDEENSHIRE.

Taken at a point about 1,000 feet above sea-level, near where cultivation meets the moorland. At about this elevation the deciduous trees gradually give way to conifers. This is a typical instance of natural sub-Alpine tree growth. Can you give any reason why fir trees are able to resist frost and snow better than deciduous trees? Mention two species of each class of tree.

Imports and Exports.

A It will be seen from the diagram below that most of the imports consist of foodstuffs and of raw materials for manufacture, while the exports are chiefly manufactured articles. The enormous amounts are difficult to realise. Eggs, which do not even appear as a separate item in the statistics given, are imported from abroad to the number of 200,000,000 each year, many millions being laid in Siberia.

| | | | |
|-----------------|-------------------|-----------------|-------------------|
| India | EXPORTS ABOUT 364 | United States | IMPORTS ABOUT 536 |
| Germany | | France | |
| Australasia | | Australasia | |
| U. States | | India | |
| France | | Germany | |
| S. Africa | | Holland | |
| Canada | | Russia | |
| Belgium | | Belgium | |
| Holland | | Canada | |
| Russia | | Spain | |
| Japan | | Other Countries | |
| Other Countries | | | |



FIGS. 100 AND 101.—ANNUAL TRADE STATISTICS.

Each unit = 1 million pounds in value. Total about 900 millions. Countries of origin and destination.

While the exports go to all countries, especially to those which have no developed manufactures, the countries from which the imports come, as can be seen from

the chart, are determined largely by latitude and climate. Thus, such animal products as meat, hides, wool and cheese are almost entirely confined to the north and south temperate zones; flat countries, with good rainfall, being best suited for dairy produce. Wheat is produced in the same latitudes, generally in the flat plains of the interior of continents, while the chief supply of fir-timber comes from the rainier and more mountainous parts nearer the coast. Raw cotton, rice, and cane-sugar are the products of well-watered tropical and subtropical plains; coffee and tea grow best on wet mountain slopes in similar latitudes (see Part I., page 20). By far the largest supply of sugar has, of late years, come from the state-aided beet-sugar producers of Germany, France, and Central Europe, whereas cane-sugar requires great heat and copious moisture for its cultivation, conditions found, as a rule, only within the tropics.

The actual values of the various articles of import of course vary from year to year, especially in the case of crops, such as wheat, which come from countries of uncertain climatic conditions. Again, the import of cattle from any country may be prohibited at any moment, to prevent the spread of disease, which prohibition may entirely alter the amounts imported from a country affected by it. Therefore these statistics must not be committed to memory.

The object of representing the values is to give a good general idea of the part played by the leading regions of the world which send their surplus natural products to this country. The general idea thus gained will remain for many years fairly accurate as to relative amounts.

In each natural region the total value of each product from all countries, which are included in the same region is represented in one block. Thus the total value of wheat and wheat-flour sent from Canada and the States is over 26 million pounds. The lines with arrow-heads indicate that both these countries have a share in the total. Again, in the "Mediterranean and South Europe region" Spain has a share in the total values of wine, oranges, other fresh fruit, raisins, olive oil, and figs, as shown by the arrows, though other countries have also a share in the total values in many instances.

It will be noticed that the various countries are arranged, as far as possible, according to latitude, and in their relative geographical positions. It follows that similar products come from regions of similar climatic conditions.

QUESTIONS AND EXERCISES.

1. From the diagrams in the first column make out roughly what the value of exports and imports to and from the leading colonies amounts to.
2. What three countries take most of our exports: and from what three countries are most of our imports derived?
3. What are the most important manufactured articles sent from this country, and what the most valuable raw materials imported? Do you notice a remarkable instance of an imported manufactured article?
4. Of the imports mentioned in the second diagram, sugar, tea, and wines are the only items taxed. Do you see any reason against taxing some of the other articles?
5. What revenue, roughly, would a tax of one-tenth of its value bring in on exported coal, imported manufactured silk, and imported butter?

The distribution of minerals cannot be said to be governed by climatic causes, and therefore the actual amounts of the leading minerals imported from foreign countries are here given in a diagram.

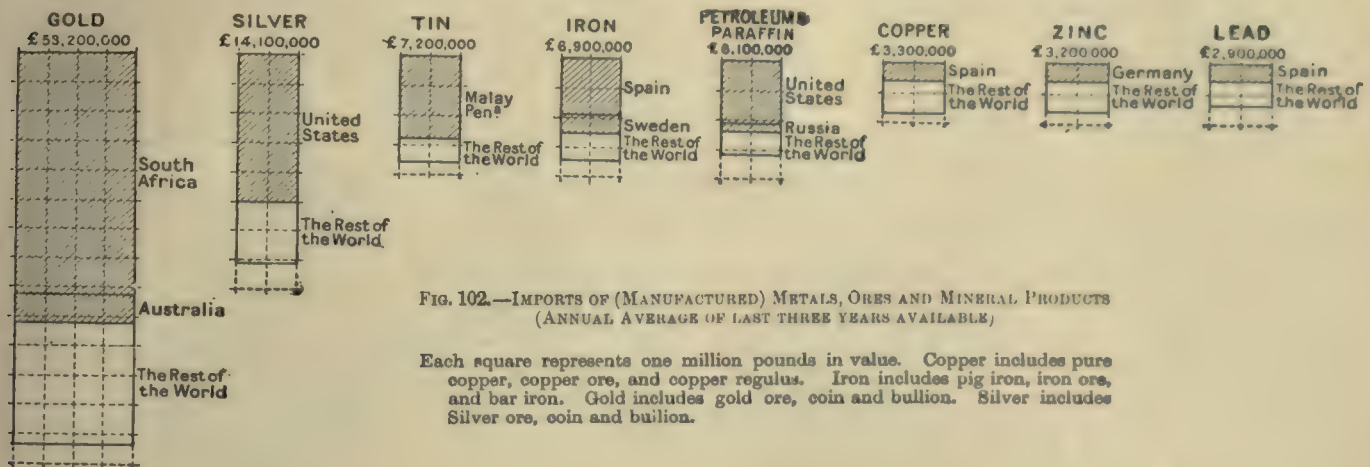


FIG. 102.—IMPORTS OF (MANUFACTURED) METALS, ORES AND MINERAL PRODUCTS (ANNUAL AVERAGE OF LAST THREE YEARS AVAILABLE)

Each square represents one million pounds in value. Copper includes pure copper, copper ore, and copper regulus. Iron includes pig iron, iron ore, and bar iron. Gold includes gold ore, coin and bullion. Silver includes silver ore, coin and bullion.

Only the highly developed coal-producing countries can manufacture goods on a large scale, so as to enter this country. The diagram below summarises the most important items.

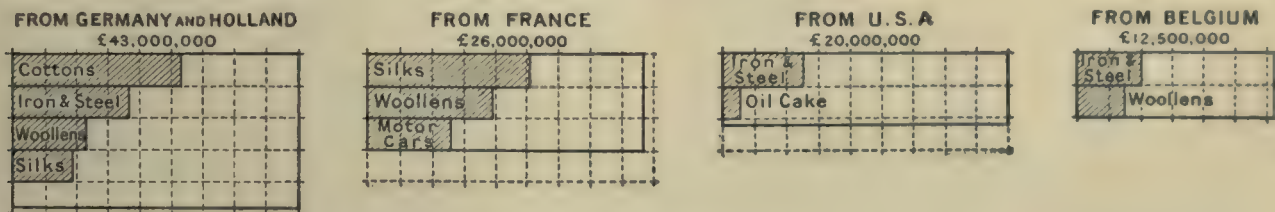


FIG. 103.—IMPORTS OF MANUFACTURED GOODS (ANNUAL AVERAGE OF LAST THREE YEARS AVAILABLE).

B Great caution must be observed in using statistics as to comparative trade. To add together the declared imports and exports and look upon the result as the volume of a country's trade, is a very uncertain method of testing its prosperity. It does not take into account the internal activity in production for the home market, or the amounts earned by the carrying trade, or by investments abroad, to say nothing of smaller items. Thus France produces most of the wheat required by her people, and the import of food stuffs into France is therefore materially decreased. Much of the deficiency between the values of exports and imports into the United Kingdom can easily be accounted for by the amounts earned by the above-mentioned "invisible" imports. In the case of Holland, Belgium, and Germany the growing comparative deficiency of the value of exports as opposed to imports is certainly no indication of any decline in the commercial prosperity of those countries. Their growing industrial populations naturally require more and more foreign foodstuffs, and these are paid for only partially by the value of their increasing export of manufactured goods. Their growing commercial abilities are rapidly being used in exploiting the commerce of foreign countries, and so building up a source of national prosperity which cannot be gauged by mere import and export returns.

The comparison of a series of annual returns relating to the same departments of trade is of course an excellent method of testing various tendencies.

C In discussing questions of international trade, it is obvious that politicians can appeal to various kinds of statistics to prove almost anything, and so it is well to fall back upon the unanswerable arguments which are supplied by the natural causes which are permanent in spite of artificial barriers to a free interchange of commodities. Climate, geographical position, and the arrangement of minerals beneath the surface cannot be much altered by human ordinances, and ultimately such underlying causes as these are certain to shape the destinies of international commerce.

To take an example. During the last twenty years an enormous production of beet sugar has been brought about in central Europe by a system of state bounties. Now that the taxpayers of most of the European states have objected, and the system has been practically stopped, the production of sugar will depend upon more



FIG. 104.
COMPARATIVE COMMERCE.

Totals of Exports and Imports (Annual Average of last 3 years available). Each unit = £100,000,000.

natural causes. If tropical cane sugar can be produced cheaper, it is certain to put an end to the export of European beet sugar to the United Kingdom.

In many countries no doubt it is advantageous to foster the growth of new industries by a tariff fence, but only when the natural conditions are favourable for a continuance of those industries, when eventually the protective barrier is removed.

The great steel and iron industries of the United States may be quoted as an example of such a growth. Their eventual prosperity, however, must depend upon natural supplies of coal and iron-ore in convenient positions.

QUESTIONS AND EXERCISES.

A 1. From what countries does the United Kingdom get its chief supplies of (a) Wheat, (b) Wool, (c) Raw Cotton, (d) Rubber, (e) Wine, (f) Tea, (g) Timber, (h) Sugar (cane or beet), (i) Fresh Meat, (j) Live Cattle?

2. Show by a diagram on squared paper the comparative values of the above imports, each square representing a million pounds.

3. What are the chief textile industries of this country, and round what towns do they centre?

4. What countries import into the British Isles considerable quantities of Iron and Steel, Manufactured Cotton, Manufactured Wool, Manufactured Silk? Give the value in each case to the nearest million.

5. From what countries does the United Kingdom get its chief supplies of Gold, Silver, Iron, Petroleum, Tin?

B 1. What are the most characteristic imports into the British Isles from (a) Egypt, (b) New Zealand, (c) China, (d) South Africa, (e) India?

2. What would you expect to be the most important articles of export from Liverpool, Hull, Glasgow?

3. What are the chief towns in the British Isles which owe their importance to Textile Industries?

4. What countries send us the largest amount of manufactured goods? What conditions enable them to do so?

C 1. What conditions of climate, etc., are necessary for the production of Rubber, Wool, Cotton, Tea? (See page 20.)

2. What special articles are imported from Greece, Spain, Norway, Austria, Algeria?

3. From what countries is the chief import of Copper, Lead, and Zinc derived?

REVISION QUESTIONS.

A 1. What are the units taken for length, height, population, and area?

2. Compare the climate of Glasgow with other places in the same latitude, in winter and summer, in regard to temperature. Account for the differences.

3. Estimate from Plate 10, without measuring, the distance between the mouth of the Tyne and London, between Snowdon and Ben Nevis, between London and Cape Clear, the Lizard and Cape Wrath.

4. Reproduce, from memory, on squared paper the diagram on page 32.

5. From Plate 12 write down the parts of the British Isles which have the greatest and least annual range of temperature.

6. Why have the Isle of Wight and the Orkneys the same average heat in January?

7. Mention three railway routes from London to Edinburgh, adding two towns on each. Which is the easiest, which the most difficult as regards gradients?

8. Give three distinct routes between London and Paris, mentioning the English railways used, and the ports of departure.

9. What exports and imports would naturally go through Hull? From and to what places would they be passing in each case?

10. The west of the British Isles is chiefly a grazing country, the eastern counties of England are corn producing. How far is this true? Give the climatic and other causes at work.

B 1. Give the approximate latitude of Land's End, London, Newcastle, and the Orkneys; the longitude of the Lizard and Cape Clear.

2. At noon in London what would be the actual time (by the sun) at Exeter, Dublin, Limerick, and Yarmouth?

3. Explain, with diagram, the geological formation of the Weald; and show how the present arrangement of its surface and direction of its streams have been caused.

4. From Plate 8, estimate the distances (to nearest 50 miles) along lines of latitude from London to (a) Newfoundland, (b) Vancouver Island, (c) Lake Baikal; along the Meridian from London to the equator. Could shorter routes be chosen in any of these cases? If so, explain why.

5. What are the leading manufactures of the United Kingdom, and what are their chief centres? Give reasons for their position in each case.

6. Name the three greatest coal-producing countries. Give some idea of the comparative amounts produced annually by each.

C 1. What is the difference between the arrangement of the coal-beds in South Wales and in the Pennines? Illustrate by sections.

2. Name three ways of going from London to Limerick, giving four towns on each route, including the ferry towns.

3. In a journey round the world from London by sea, via the Suez Canal, China, Japan, and Canada, what important towns would be passed by a traveller?

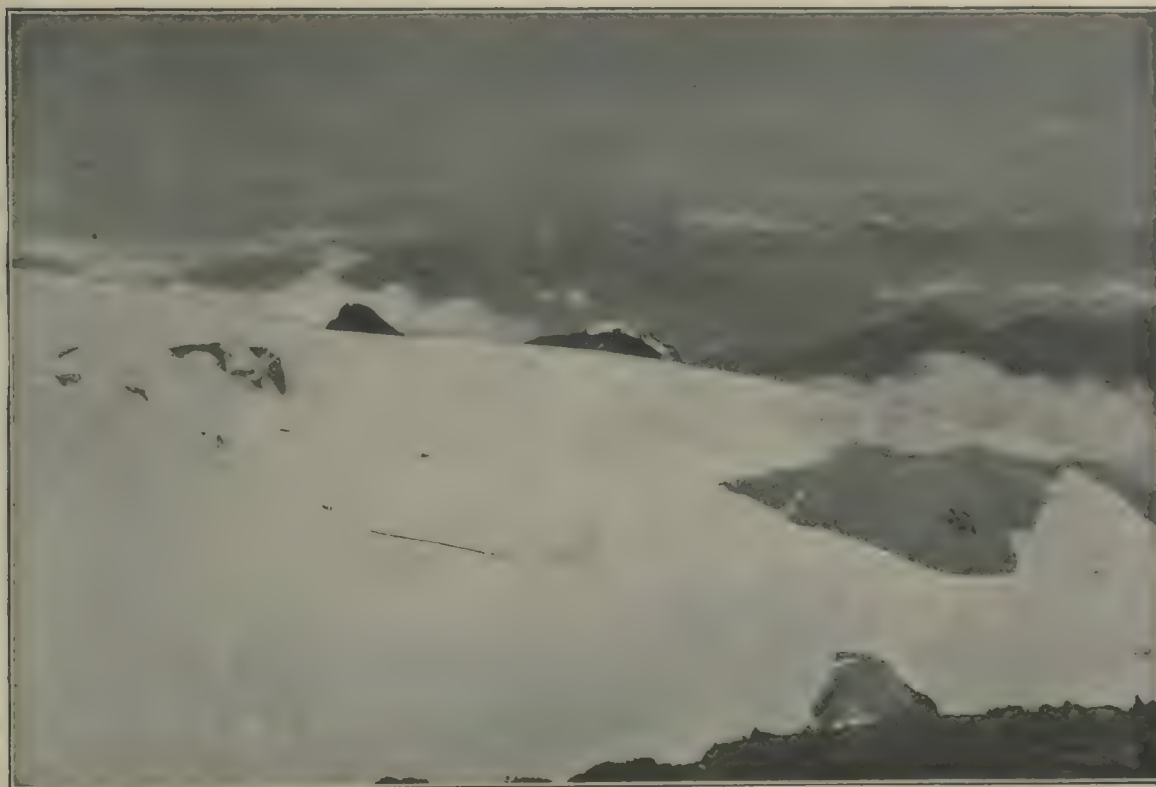
4. Give an account of the distribution of population in the British Isles; account for the inequalities.

5. Give some account of the inland navigation of the British Isles. Differentiate between the depths of the various waterways.

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(NOTE.—It is recommended to revise Plates 8 and 9 with the questions on page 29, at the beginning of each term.)



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FIG. 105.—VIEW OVER AN ALPINE SNOW-FIELD.

The above picture indicates the broken character of the Alps; the result of denudation upon folded and twisted beds of stratified rock. Can you distinguish any human beings on the snow-field? How many are there? Account for the broken patches on the snow-field. Would you expect a glacier lower down? How do you account for the position of the clouds comparatively low down, whilst it is clear above? The photograph was taken near mid-day. In what direction was the camera pointing?

Size, Position in World and Surface.

A The size of Europe compared with other continents can be seen at a glance from the map on Plate 8; its position in the world can best be seen on a globe, but can be fairly well judged from the map on the opposite page. Here also the parts of the world in corresponding latitudes should be carefully noted. Its climate and rainfall must be compared with the conditions elsewhere from a careful study of Plates 3, 4, and 5.

If a degree of latitude is taken roughly as 70 miles its extent from north to south can be easily calculated, while its breadth from west to east can be similarly ascertained by taking a degree of longitude as equal to 53 miles in latitude 40° , as equal to 45 miles in latitude 50° , and 34 miles in latitude 60° .

In no other region of the world do great inlets of the ocean penetrate so far inland. Europe, west of the line which joins the White Sea to the Sea of Asof, presents an extraordinary intermingling of sea and land. Within this area it is a rare exception to find any town as much as 500 miles from the nearest seaport, or which cannot be reached from the sea by a twelve-hours' railway journey.

Great navigable rivers spread a network of waterways over almost the entire Continent, and serve to make the sea still more accessible.

The results of the above conditions on climate, commerce and civilisation are almost incalculable.

Surface.

The contour-colours in the map opposite at once show that if the great peninsulas are cut off and the mountain cores of the Alps and Carpathians are omitted, most of the remainder of Europe is a vast plain. Between the west of Ireland and the Ural Mountains no mass of high land intervenes.

In considering the arrangement of mountain and plain and the direction of valleys, it is very important to notice by what natural routes communication is most easy between the various countries, how goods can most economically be taken from the northerly gulfs of the Mediterranean to Central Europe, or how interchange of commodities can take place with least difficulty between the great valleys of the Rhine, Rhone and Danube.

QUESTIONS AND EXERCISES.

- A** 1. Reckoning by the above lengths given for degrees of lat. and long., estimate the distance between North Cape and Cape Matapan; the Adriatic and Baltic; Black Sea and Baltic; White Sea and Sea of Asof; and along the line of latitude between Land's End and Ural River; the West Coast of Portugal and the Caspian.
2. What three great rivers rise in the Alps?
3. Name the largest lake in Europe, and the four largest islands in the Mediterranean in order of size; also three volcanoes in Europe; and the two longest rivers in order.
4. Write a list, with their symbols, of all rivers, mountains, parts of the sea, islands, lakes, and capes, in your section. Be ready to repeat from Test Map.
5. Write down in order of size Iceland, Cyprus, Crete, Sardinia, Ireland.



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FIG. 106.—A FIORD IN NORTHERN SCANDINAVIA.

This was taken in latitude 68° N., near what letter on plate 22 must it be? Could the highest mountain in the picture be over 3,000 feet, judging from the contour-colouring? Do you see any marks left by the tide? Do the trees growing on the rocks give any indication as to the amount of rainfall? How would you account for the formation of fiords? Have they been worn by the sea? Or are they submerged valleys? Has ice-action anything to do with their peculiarities?

- B** 1. Judging from the map, what rivers should you guess to be not navigable?
2. Name ten rivers in order from north to south, which run into the ocean between Denmark and Gibraltar. Six from west to east, running into the Mediterranean, Adriatic, and Black Sea.
3. What rivers in order would a traveller cross in going from the Elbe mouth to the Neva? What straits would he pass through in sailing from the Baltic to the Black Sea?
4. What three great rivers rise near the Valdai Hills?
5. Mention ten mountain systems, saying in what country or countries each lies.
6. Mention two large low-lying tracts outside the great plain.
7. What rivers are crossed in order from west to east by lat. 50° N.?
8. Follow lat. 40° N. from west to east, and write a list of the peninsulas, parts of sea and islands which are met with.

- C** 1. In going due west from the source of the Meuse to the mouth of the Volga, what river basins would a traveller cross in succession?
2. Compare the depths of the Black Sea and White Sea, the Mediterranean and the Baltic, the Straits of Dover and Gibraltar.
3. How can you account for the fact that the surface currents always flow out of the Baltic and into the Mediterranean?
4. Which river in Europe would you expect to carry most water, and why?
5. In what parts of Europe would you expect glaciers, and why?
6. The water below a certain depth in the Black Sea is stagnant and almost devoid of life. Explain the reasons.
7. By what routes would a canal pass most easily (a) from the Bay of Biscay to the Mediterranean; (b) from the Baltic to the Black Sea? Would the 600-ft. contour be crossed in both cases?
8. What river valleys does the Orient Express traverse between Paris and Constantinople?
9. Judging by the contours, what geological changes would you guess to have taken place around the British Isles and near the north end of the Caspian Sea?
10. Arrange in order of saltness the Caspian, Mediterranean, Baltic and Black Seas, and give reasons for your order.

Scale 1:25,000,000 (395 miles-1 inch) 0 100 200 300 400 500 Statute Miles



EUROPE.—Physical Fact Map.—Test.



Explanation
 R1, R2, etc. Rivers in order of length
 M1, M2, etc. Mountains in order of height
 I1, I2, etc. Islands
 A, B, etc. Peninsulas
 C1, C2, etc. Capes
 L1, L2, etc. Lakes
 Pen. 1, Pen. 2, etc. Peninsulas
 N1, N2, etc. Seas which make up the Mediterranean.

COMPARATIVE HEIGHTS OF MOUNTAINS.

Modified Conical Projection.

Scale 1:25,000,000 (395 miles=1 inch) 0 100 200 300 400 500 Statute Miles

QUESTIONS AND EXERCISES. (Use Test Map only.)

- A**
1. Explain the exact meaning of the contour-colouring on this map. Is any part of the land surface shown to be below sea-level?
 2. Write a list, with their symbols, of the parts of the sea in your section.
 3. Do the same for the mountain ranges.
 4. Write a list, with their symbols, of the rivers in your section which run into the Arctic and Baltic.
 5. Write a list, with symbols, of the rivers in your section which run into the North Sea, English Channel, Bay of Biscay and Atlantic.
 6. Write a list of rivers, with symbols, in your section, which run into the Mediterranean, Adriatic, Black Sea, Sea of Asof and Caspian.
 7. What meridian runs off Portuguese coast, what meridian through Ural Mountains, what line of latitude through Sardinia, and through the north of Scandinavia?
 8. Mention a town in America, and a town in China, in the same latitude as the Dardanelles.
 9. How many degrees, roughly, is it from the North Cape to the extreme south of the Morea? What distance, taking 70 miles to a degree?
 10. In lat 50° N. how many miles go to a degree? Estimate the distance, roughly, along line of latitude from Cape Clear to the Urals. Do the same from the Shetlands to the Urals.
 11. Compare the latitude of the Sea of Okhotsk, Hudson Bay and the Baltic.
 12. Is there any spot in Europe which is farther from the sea than the extreme South of England from the extreme North of Scotland (mainland)?
 13. Name, with symbols, six islands or groups of islands in the Mediterranean, one in the Baltic (in your section).
 14. Name the Capes of Europe farthest to the north, west and south.
 15. What three rivers rise in the Alps?
 16. Name all the islands, with their symbols, which lie outside the enclosed seas of Europe (in your section only).
 17. What are the five Peninsulas named? Which of these are mountainous? (Do not count the Morea as one.)
 18. Which is the largest lake in Europe?
 19. Name the mountains, from the diagram, in order of height, with their symbols.

- B**
1. Write a list, with symbols, of the rivers marked in brown or blue.
 2. Do the same for the parts of the sea and capes marked in brown or blue.
 3. Is it true to say that the courses of most of the rivers of Europe have a general tendency to the north-west or south-east? Name the notable exceptions.
 4. What is the latitude of the extreme south of Great Britain; of the river Neva?
 5. What two lakes are drained by the Neva?
 6. Are the Caucasus Mountains four times higher than Ben Nevis; the Pyrenees three times; the Alps three times; the Carpathians twice as high?
 7. Say in each case whether the average depth of these seas is more or less than 600 feet: Adriatic, Ægean, North Sea, Caspian, Baltic. Which of these is the deepest?
 8. Into how many basins of more than 6,000 feet deep is the Mediterranean divided? Which of these has least area?

- C**
1. Give a list, with their symbols, of all the lakes, islands, rivers, capes, and straits, marked in the map.
 2. What line of latitude runs through Cairo? Mention a town in Australia and in South Africa in about the same latitude.
 3. How could you account for the origin of the fiorded western coasts of Scandinavia and Scotland, and for their great number of islands?
 4. Compare the rivers of the Iberian Peninsula and of Eastern Europe in respect of navigability.
 5. Europe is a great plain except for its peninsulas. Is this quite true? Why not?

Historical Geography.

A The table of dates given below will help to remind the reader of any knowledge that he may possess bearing upon the political history of Europe. It is a fascinating, if complicated, pursuit to work out the causes which have led to the present distribution of languages and peoples, and to the modern arrangement of states and political boundaries. The natural barriers of mountain and sea and river have generally asserted themselves, but in many instances such natural boundaries have been overstepped by the force of circumstances. The great plains of Eastern Europe offered an easy conquest for the nomadic tribes of Asia. The mountainous peninsulas of the south and north-west have developed distinct types of inhabitants.

| A | B | C |
|---|--|---|
| 1200-600 B.C. Phœnician power. | | |
| 450 B.C. Greek power at its height. | | |
| 200 B.C.-400 A.D. Roman power predominant. | 330 A.D. Constantinople founded. | |
| 448 A.D. Angles and Saxons invade England. | | 800 A.D. Charlemagne Emperor. |
| 1066 Normans in England. | 711-1492. Saracens and Moors in Spain. | 1096-1270. Crusades. |
| 1453. Constantinople taken by the Turks. Greek scholars scattered over Western Europe. | | 1516. Ferdinand and Isabella rule over United Spain. |
| | 1806. Austria-Hungary took its modern form. | |
| | 1815. Norway and Sweden joined. | |
| | 1830. Belgium gained independence. | |
| | 1830. Greece gained independence. | 1878. Rumania, Servia, and Montenegro freed from Turkey, Bosnia and Herzegovina under Austria. |
| 1860. United Italy. | | 1885. Bulgaria formed. |
| 1871. German Empire. | 1905. Norway separated from Sweden. | |

NOTES ON DATES.

A The voyages of the Phœnicians from Tyre reached as far as the Scilly Isles, and their colonies spread throughout the Mediterranean. The Greek influence became strong about 500, and largely guided the development of Roman civilisation. This latter has naturally had the most effect on European history.

The Mohammedan invasions into Spain and into the Danube valley forced into union the peoples of Europe to resist them. Thus were formed the kingdoms of Spain and Portugal.

The Napoleonic wars had a similar result, and after Waterloo the political map of Europe rapidly began to take its modern arrangement.

B The foundation of Constantinople marked the beginning of the cleavage between the eastern and western Roman Empire. Later on, when the western half lapsed into a condition of semi-barbarism, the elements of Greek culture were there guarded. The Moslem invasion of 1453 drove the Greek scholars to the west, and brought about the revival of learning on this side of the Alps.

Austria-Hungary shows signs at the present day of disruption. German influence may succeed eventually in separating west from east.

C It is rather unexpected to find that from quite early times Spain and Portugal have been separate. There is no natural division between the countries, and, even historically, their separation seems to have been almost accidental.

The termination of the Russo-Turkish war in 1878 practically settled the political boundaries of the Balkan Peninsula as they are to-day. Bulgaria was then made an autonomous principality, but did not have Eastern Rumelia joined to it till 1885.

The desire of Russia and Austria to reach Constantinople and Salonika will probably lead at no very distant date to a political rearrangement of the Peninsula. Such is the so-called "Problem of the Near East."

A The Political Fact Map opposite is intended to give a general view of the present arrangement of European countries, with the great towns in each. In the case of Denmark, Norway, Sweden, and Russia, town names are given much more freely, as these areas are not repeated in special maps below.

The political divisions and towns are numbered in the Test Map, according to their population at the last census. Turkey in Europe is here treated apart from Turkey in Asia.

QUESTIONS AND EXERCISES.

A 1. Write a list (in order of population), with symbols, of the countries of Europe, adding after each its chief towns marked in brown, with their symbols, in order. Be ready to repeat from Test Map.

2. On or near what great rivers are Madrid, Paris, Vienna, St. Petersburg, Bucharest, Belgrade, Warsaw, Rome?

3. To what countries do these islands belong: Cyprus, Malta, Sicily, Corsica, Crete, Channel Islands, Iceland, Balearic Islands?

4. What towns in Europe have a greater population than Glasgow; what countries than Spain?

5. Which six countries in Europe would you pick out as having the least area; which four as having the largest?

6. What is Russia's naval station in the Black Sea?

B 1. Make a list of the Continental towns printed in brown or blue, with their symbols. Be ready to repeat from the Test Map.

2. What seas touch Russia? Name a port on each.

3. Write a list of towns (from this map) within two degrees of lat. 40°, lat. 45°, lat. 51°, lat. 60°.

4. Name the four towns in Europe with a population of over one million. (They are marked by squares instead of circles.)

C 1. Write a list of all towns, with their symbols, and be ready to repeat from Test Map.

2. What is the difference in time between Greenwich and Hamburg, Cronstadt, Rostof, and Baku?

3. What are Russia's two chief naval ports?

4. Do political boundaries follow the main watersheds of the Pyrenees, Caucasus, Urals, and Carpathians?

5. Write down the chief Russian river basins, with the towns in each.

It is useful to know the methods of spelling well-known names in the language of the country to which they belong: Deutsches Reich (German Empire), España (Spain), Italia (Italy), La Suisse, Svizzera, Schweiz (Switzerland), Österreich (Austria), Ungarn (Hungary), Roma (Rome), Wien (Vienna), Donau (Danube).

Seasonal Temperature.

A The maps with Isotherms for July and January give an excellent illustration of the difference between Oceanic and Continental conditions. All along the western borders of Europe, where warm westerly and south-westerly winds from the Atlantic are generally blowing across the land, it will be noticed that the difference in temperature between winter and summer is comparatively small. The farther any region is removed from such influences, the greater becomes the range of temperature. The condition of rivers and lakes in the more continental parts of Europe during winter, when compared with the state of affairs in the British Isles, perhaps affords the most striking example of the climatic differences.

While it is rare for the rivers of England or France to be impeded by ice, the Rhine at Cologne is annually ice-blocked for an average period of three weeks. Farther east in the same latitude the Oder in Silesia averages more than a month of ice-covering, the Vistula a considerably longer period. The lower reaches of the Danube in Bulgaria remain open for the whole winter only about once every five years, and are usually blocked for nearly six weeks. The whole of the Volga River system is of course annually ice-bound, and even the northern half of the salt Caspian is usually obstructed. On the much fresher Baltic Sea navigation is hindered for more than four months during each winter.

Winds and Rainfall.

With the map showing the arrangement of mountain and plain, it is easy to compare the Isotherm, Isobar and Wind Maps, and so deduce the probable distribution of rainfall.

On the west of Europe there is a great area of ocean from which an almost constant evaporation is taking place. Any wind, therefore, which blows from the west or south-west is likely to bring rain with it. Now, most of Europe is in the region of prevailing south-west winds (see Plate 4), and therefore along its oceanic border copious rainfall is common.



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FIG. 107.—Moscow.

[Photochrom Co., Ltd.

The view shows the ancient fortress of the Kremlin, now covered with magnificent churches and palaces, perhaps the most striking group of buildings in existence. Does the architecture resemble or differ from any that you know? Into what river does this water flow? What would the river look like in winter time? Does the water look low? Is this usually the case with Russian rivers? Why do rivers rising in the Alps not suffer in this way?

EUROPE.—Political Fact Map.

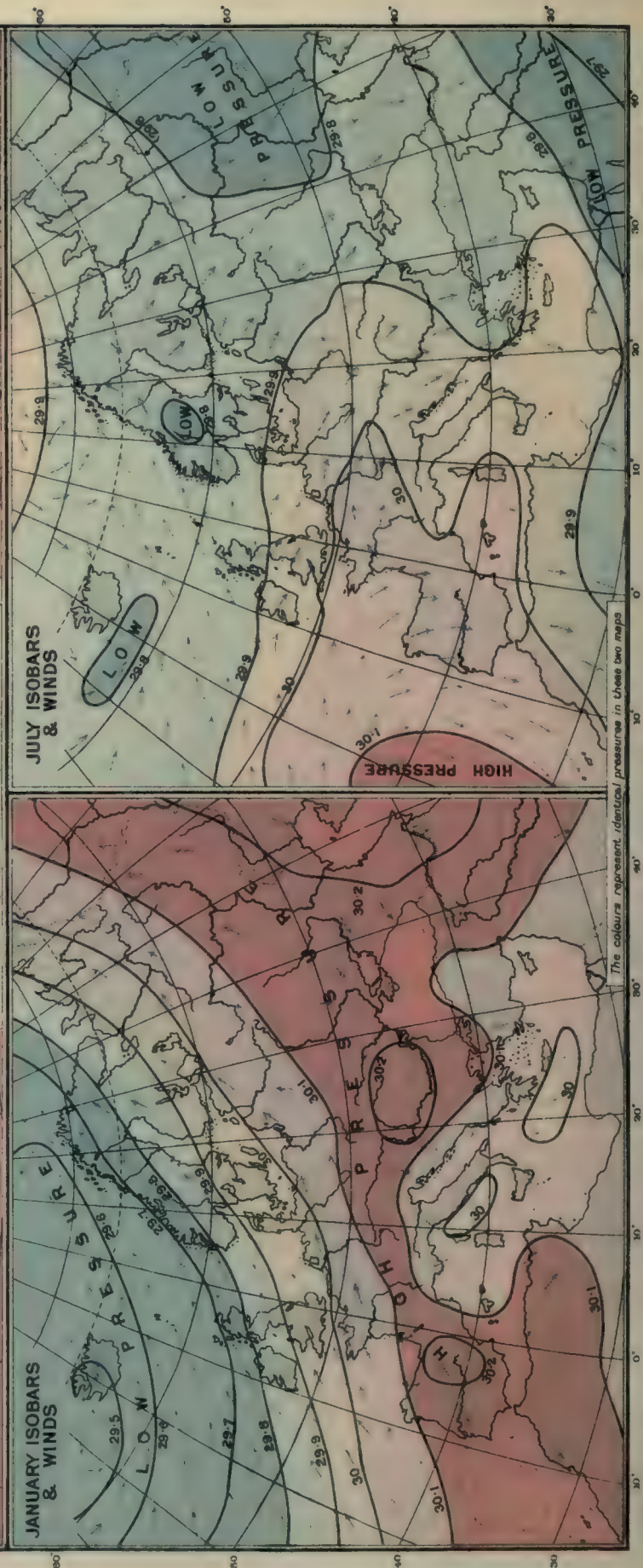
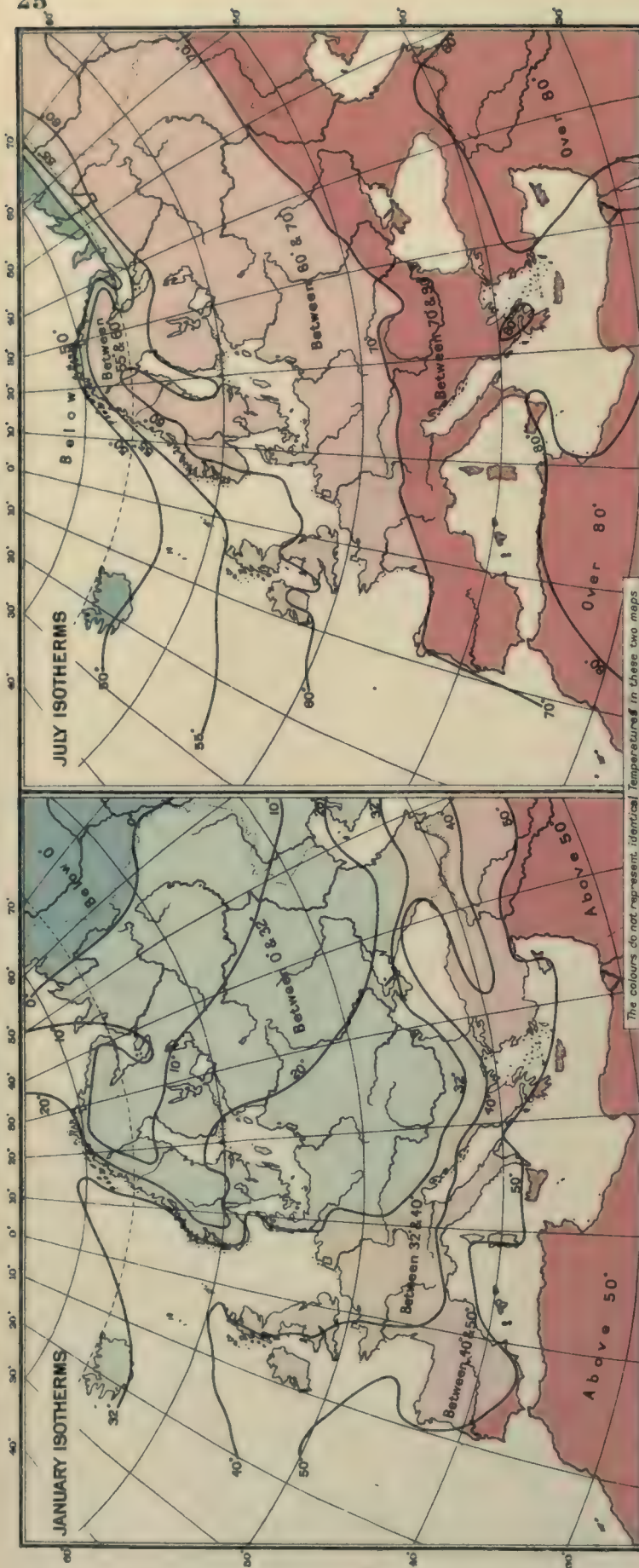


EUROPE.—Political Fact Map.—Test.

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EUROPE—Seasonal Temperature & Winds.



It is only where mountain barriers rise abruptly at right angles to the course of these rain-bearing winds that they are forced suddenly upwards, and so, being cooled, have to part with most of their moisture. Wherever there is a comparatively flat land, as in the central plain of Europe, it is possible for the rain to be distributed far inland, gradually diminishing in amount as the ocean is left behind. Any sudden rise in the surface increases the local rainfall, while a drop on to an inland plain naturally causes a decrease. (See Plate 26.)

B The causes of the comparatively dry patches on the map of Europe are not usually difficult to find.

Any enclosed basin, such as Bohemia, or the great Hungarian plains, or the Po Valley, is certain to receive comparatively little rain. Most of the moisture has been wrung out from the winds in their ascent of the surrounding mountain barriers. As they descend upon the plains they are becoming warmer, and have a tendency to pick up rather than to drop water. The tableland in Central Spain is affected in much the same way, while any low land lying under the lee of a mountain range is liable to a diminution of rainfall. The great wheat-producing areas of Europe in Hungary, Rumania and Russia correspond roughly to these regions, where a hot rainless summer is suitable to the ripening of the grain.

Besides the influence of mountains in causing precipitation of moisture, the arrangement of Isotherms must not be overlooked in searching for the causes of the distribution of rainfall. In winter the general trend of Isotherms is from south-east to north-west, at right angles to the prevailing winds; therefore winds from the ocean become rapidly cooled, and deposit their moisture along the western boundary of the continent. In summer there is no such cause at work, and rain can more easily be carried inwards.

Again, in winter there is a high-pressure area over Central Europe which prevents oceanic wind currents from reaching far inland.

C During the winter time, while the cold is great, and the barometer high on the surrounding countries, cyclones frequently form over the Adriatic and Black seas. The result is a circular motion of the atmosphere towards the centre of the depressions. Thus severe north-easterly winds are common at Trieste and Odessa, accompanied by greater cold.

Another noticeable feature in winter is the frequent formation of a high-pressure area extending over the Alps and Carpathians owing to the cold there generated. The result is the fine, cold and windless weather so well known by skaters and tobogganers in Switzerland.

It might be expected that in summer time the lower pressure over Central Europe would enable rain-bearing winds from the Mediterranean to reach the southern parts of the continent; but as a matter of fact the summer is the dry season in those regions. The reason is that the influence of the north-east trade winds then extends as far north as lat. 45°. The extreme heat and low pressure over the Sahara draw in the winds powerfully from the Mediterranean region, and so deprive Italy and Greece of summer moisture.

A temporary change in these conditions brings the

warm Sirocco wind back from the hot north of Africa, just as a cyclonic disturbance over the Alps often draws in the warm Föhn wind from Italy, which rapidly thaws the snows upon the mountains.

QUESTIONS AND EXERCISES ON TEMPERATURE, PRESSURE, AND WINDS.

(For elevated regions 1 degree must be taken off for each rise of 300 feet.)

A 1. On the January Isotherm Map what temperatures are expressed by the dark red, light red, brown, light blue, and dark blue; what temperature by the same tints on the July Map?

2. Write down the approximate January and July temperatures of the north of Scotland, of the west coast of Wales, of the north-west of Spain. What is the difference in each case? At the point on the Volga where isotherm 10° crosses in January, isotherm 70° crosses in July; why is this latter difference so much greater than in the former cases?

3. What is the coldest, what the hottest, part of Europe in January? Where does isotherm 70° reach farthest north in July? Where does isotherm 40° go farthest north in January? What parts of Europe have a temperature of over 80° in July?

4. Which isotherms are crossed in order from west to east by lat. 50° in January; which in July?

5. Judging from the January isotherms, what nations would you expect to produce the best skaters?

6. What pressures are indicated by the various tints in the lower two maps?

7. In the January Map where are the highest pressure areas to be found, where the lowest?

8. The average pressure over the north end of the Caspian varies nearly half an inch between January and July. In the south of England there is no variation in the average. Can you account for this?

9. What is the prevailing direction of the winds in the British Isles? When do winds from the ocean reach Central Russia? and why?

10. In what parts of Europe would you expect most rainfall? where least? Give reasons.

B 1. Make a tracing of the outline of Europe from one of these maps. Mark in the July isotherms by solid lines, the January isotherms by dotted lines. Shade in pencil the land areas which have a difference in temperature between July and January of more than 50°. Shade in ink those areas which have a difference of less than 30°.

2. In January the isotherms have a tendency to run from north-west to south-east, in July more from west to east. Can you account for this?

3. Give the approximate average January and July temperature and pressure of the Orkneys, Crete, Sea of Asof, St. Petersburg, Gibraltar.

4. Cornwall, The Riviera, Dalmatia, and the southern coast of the Crimea, are winter resorts; Scotland and Western Norway are summer resorts. Do the isotherms give reasons for this?

5. Judging from the prevailing winds, would you expect Eastern Spain to have a high or low rainfall?

6. In January the winds have a tendency to cross the isotherms at right angles, in July they do not do so nearly so much. What effect is thus brought about on the distribution of rainfall?

C 1. Account for the irregular course of isotherm 40° in January, for the comparatively even course of isotherm 70° in July.

2. Compare the average temperatures in January and July of Archangel and Killarney, of Cyprus and Iceland, of Astrakhan and Cardiff.

3. Account for the direction of the winds over the Mediterranean in July. How does this affect the rainfall of Italy and Greece?

4. Trace the outline of Europe and show, by shading, the land areas which have a temperature (in January) of less than 32° combined with a pressure of over 30.1 inches; also those areas which have a temperature (in January) of over 40°, with a pressure of less than 30.1 inches.

Rainfall and Vegetation.

A The results of rainfall upon vegetation can be very clearly seen by a comparison of the two maps on Plate 26. If the position of the mountains and plains of Europe is borne in mind, as well as the facts learnt above, most of the general truths shown on these maps can be accounted for.

It must be remembered, however, that the Rainfall Map represents the average annual fall, and, of course, cannot show the seasonal distribution. The value of rainfall depends very much upon whether its amount is evenly distributed throughout the year, or whether it falls chiefly in winter or summer. Again, hotter regions require more rainfall than colder for vegetation to flourish.

The Vegetation Map can show only some of the most important facts.

In a long civilised region, such as Europe, agriculture has become highly developed and complicated; natural conditions have often been much modified by the growth of great towns, the cutting down of forests, and by irrigation. Again, the line between arable and pasture-land and desert, or between other natural regions, cannot be in reality as sharply drawn as it must be of necessity on a map.

There is sufficient moisture for the growth of natural forest over the whole of Europe, with the exception of the plains of the east and south-east and on the Spanish plateau. The highest regions of the Alps, Pyrenees, Sierra Nevada, and the Scandinavian mountains are too cold for tree growth, as are also some of the low coasts of Northern Russia. The surface is, however, by no means covered by forests wherever they could grow. All, or nearly all, rich comparatively low-lying tracts of land are kept clear for agriculture and grazing. Only poor sandy soils or mountain slopes are allowed to grow their natural timber. The character of the trees naturally differs with the isotherms. Generally spruce and larch are the prevailing types in Northern and Eastern Europe; various deciduous trees, such as

oak and birch, of the more temperate regions; chestnuts, cork-trees, olives and orange-trees of the Mediterranean coastal districts. Similarly, grass lands with a certain proportion of such crops as oats, barley and rye are characteristic of the wetter and cloudier regions of the west and north-west. Where the rainfall becomes less and the summer hotter and sunnier, wheat becomes a leading crop as in France, parts of Germany, Hungary, Rumania, and Bulgaria, and the south-east of Russia. Where a still warmer summer is usual, maize appears frequently as in the region to the south of the July isotherm 70°.

The northern limit of the growth of the vine for wine-making follows the isotherm to about the centre of Germany; after this the extreme cold of winter forces it to retreat southwards. Figs, oranges, currants and grapes for use as fresh fruit are found only along the most favoured coasts of the Mediterranean.

Vineyards.

B Well-drained sunny slopes in countries where the autumn is comparatively warm and free of clouds, are the conditions suited to the growth of the vine. The flavour of the wine produced depends, of course, upon the peculiarities of soil and the skill of the growers and makers.

France is the great wine-producing country of the world; but Italy, Spain and Austria-Hungary all produce large quantities. The distribution of famous vineyards can be seen from Plate 26; the comparative amounts produced by the four leading countries are shown by these percentages; France, 43 per cent.; Italy, 30 per cent.; Spain, 20 per cent.; Austria-Hungary, 7 per cent. No other country produces as much as 1 per cent., though Germany, Portugal, Greece, Rumania, Turkey, Bulgaria and Russia all have a share.

Other Special Crops.

C During the last twenty years of the nineteenth century an enormous cultivation of beet for sugar-making has grown up in Central Europe owing to protection and bounties. The north-west of France, Belgium, the part of Germany between the Elbe and Weser, Bohemia, and the part of Russia between the Dnieper and Hungary are the chief regions for this culture. Good soil and careful cultivation are necessary for success.

The potato forms an important food to large numbers of people in Europe. It will thrive on comparatively poor soil, and will not bear the cost of long carriage. It is the most important crop in Western Ireland, Holland and North Germany. Much so-called brandy is made from it in the latter country. Real brandy is made from the grape, and the best comes from the district just north of Bordeaux (Cognac).

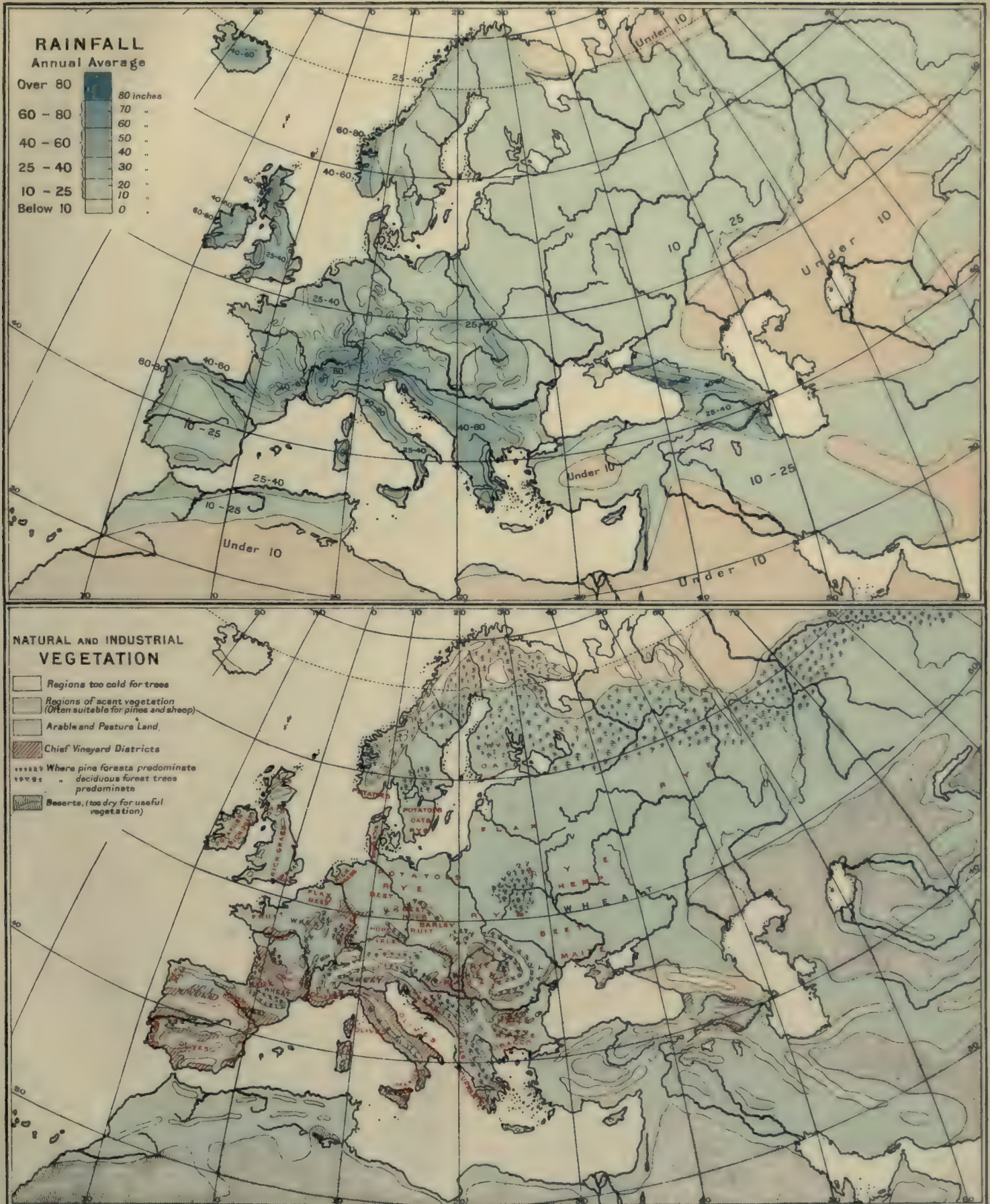
Hops are found in most profusion in Bohemia and Bavaria, and are used in the famous breweries of Munich; with them barley is naturally grown for the same purpose of beer-making.

In those parts of the continent where the summer is too cold for successful wheat-growing, rye, barley and oats become the chief cereals. In Northern Germany,



FIG. 108.—FOREST OF SPRUCE-FIR.

This view was taken in Switzerland at a height of about 5,000 feet. Therefore the winter temperatures resemble those of north-eastern Europe. This kind of tree-growth is common over the northern half of Russia. Of course the trees become more and more stunted as the region of extreme cold is approached. Notice that the weight of snow cannot break the branches.



Scandinavia and Russia (outside the wheat region), rye-bread is the staple food of the poorer classes.

South of the Alps and throughout Austria-Hungary, Servia and Rumania, maize is the chief cereal, with the exception of the great Hungarian plain, where wheat is of equal importance. Maize requires great summer heat to ripen it, is a quick grower, and does not exhaust the soil.



FIG. 109.—A HUNGARIAN STEPPE.

Compare this scene to a ranch in Western Canada. Are similar conditions to be found in both regions? Would you expect the Hungarian cavalry to be efficient? How does this plain differ from an English plain in appearance? What is the peculiar wooden framework just beyond the cattle?

QUESTIONS AND EXERCISES.

1. In what five different parts is a rainfall of over 80 inches indicated. Can you account for it?
 2. What is the average annual rainfall (say from 10 to 25, or whatever it is) of Moscow, north end of Caspian Sea, Central Spain, Central Sardinia, and Gibraltar?
 3. Would you expect the rivers of Russia to carry more or less water in proportion to their length than the rivers which rise in the Alps?
 4. In what parts of Europe are there to be found regions too cold for the growth of trees? Say in each case whether this result is due to elevation or distance from the equator.
 5. In what parts are there the largest areas marked where the vegetation is scanty? What is the usual cause of this?
 6. Where are the chief wheat districts of Europe? Give the natural causes which determine their position.
- B**
1. Account for the comparatively dry patches in Central Spain, the Paris basin, the middle Danube, the centre of Asia Minor.
 2. What reasons prevent Iceland from being a fertile island?
 3. Most of the vineyards in Europe are south of lat. 50°, and west of long. 30° E. Can you account for this?
 4. In what different pursuits would you expect the inhabitants of Norway, and of Southern Russia to be chiefly engaged, owing to natural conditions of surface, rainfall, and vegetation?
 5. Make a diagram on squared paper to show the comparative amounts of wine produced by the four leading wine-producing countries of Europe, using the figures given above under "Vineyards."
- C**
1. Wheat and maize are the most important grain crops of Southern Europe; rye and oats of Northern. Account for this.
 2. Where are the chief centres in Europe of the growth of

hops, flax, hemp, potatoes, oranges, olives, currants, beet-sugar, tobacco, and barley?

3. The southern nations of Europe are wine-drinkers; beer is the chief beverage of the British Isles and Germany; spirits of Russia and Scandinavia. Can this be accounted for by natural causes?

4. Would you expect Spain and Asia Minor to have similar natural products? If so, why?

5. Contrast the natural products (other than minerals) of England and Italy, of Finland and Southern France.

6. In what countries of Europe would you expect the dairy industry to be important, and why?

Industries, Communications and Population.

A The previous maps have given a fair general idea of the conditions in Europe above ground. If a knowledge of the minerals below ground is added it ought to be possible to account for the distribution of population. The navigability of rivers and the safety of harbours depend largely upon unalterable natural conditions. Canals, river-dredging and artificial breakwaters, of course, make some difference; and in a country of concentrated trade activity, such as Europe, are of more importance than elsewhere.

The top map on Plate 27 is an attempt to show some of the conditions which have led to the enormous growth of industrial activity in Europe.

A cautious use of the map is, however, necessary. For instance, iron-ore is very widely distributed over Europe, and is worked especially near the great coal-fields. Germany (and Luxemburg) and the United Kingdom produce the largest quantities, though this fact cannot be brought out on the map. Spain and Sweden are marked as special ore-producing countries, because much of their ore is so rich and easily mined, that it can be exported at a profit. It is a feature in the industry of those countries independent of coal-fields.

Again, the size of the areas marked in blue or brown cannot give a fair idea of the value of the produce.

The great centres of industry in Europe are in Northern France, Belgium, the lower Rhine, in the great coal-fields of Great Britain, in the upper basins of the Elbe and Vistula (round Dresden and Cracow). The greatest coal-producing countries are Great Britain, Germany, France, and Belgium. The Russian coal-fields, though of large area, do not produce one-tenth of the quantity that is raised in Germany.

B The industrial centres round Lyons, Milan, Genoa, Vienna, London and Berlin might be mentioned as being next in importance to those referred to above. In only one of these cases can the proximity of coal be given as the chief cause of their prosperity. The same combination of causes which have made London, Paris, Berlin, and Vienna the great capitals

of Europe have brought about their industrial development. Their position on wide and fertile river valleys, with easy communications in all directions by water, rail, or road, explains in great measure the reason of their growth.

Milan stands in the richest agricultural district in Europe, and is the natural meeting-place for the main roads and railways which lead from the chief manufacturing regions of France and Germany, through the Alps to their natural outlet at Genoa.

The blue lines, which show inland navigation, do not distinguish between waterways suitable for big ships and those which can take only barge traffic. Ocean steamers can hardly ever make use of these lines. The canals between the Baltic and North Sea, and between the Mersey and Manchester, are the only artificial waterways made for very large vessels. Most of the big rivers can take steamers along about half their length.

The ocean routes marked on the map are of necessity only the most important, the railways only those which serve to communicate between nation and nation, or which join great ports to the interior.

Most parts of Central Europe, France, Northern Italy and England are covered with a close network of railways. The Balkan Peninsula, Spain, Scandinavia, and Russia have a comparatively small mileage of railway, owing to physical difficulties or lack of enterprise.

The petroleum fields near Baku account for the industrial region between the Black and Caspian seas. They come second only to the oil-fields of the United States in the value of their products.

C The textile industries of Europe are naturally centred in those districts where steam- or water-power is easily produced, and where abundant supplies of raw cotton or wool, or silk, can be had locally, or cheaply imported.

Thus Lancashire, Yorkshire, and Lanarkshire are the chief centres of cotton and woollen manufactures in the British Isles, while Northern France, Belgium, and the lower Rhine provinces of Germany, hold a similar position on the Continent. The towns of the upper Elbe and Vistula come next in importance. Lyons is the leading silk-weaving town in Europe. The water-power of Switzerland has enabled Zürich to have a share in these trades; the Moscow district is the chief producer of such goods for the needs of Russia.

QUESTIONS AND EXERCISES.

A 1. Give the characteristic pursuit or pursuits of these districts (agriculture, mining, or manufacture): Lancashire, Belgium, Spain, Sweden, Greece, North of Italy, Hungary, Sicily.

2. Name three great Continental ports on the North Sea with easy water communication inland; three on the Baltic.

3. What ports of France, Germany, England and Scotland have naturally most trade with North America?

4. To what parts of the world is there easy steam communication from Southampton?

5. Follow the railway routes marked on the map from Paris to Gibraltar, Paris to Naples, Paris to St. Petersburg, Berlin to Constantinople, Berlin to Odessa, Lisbon to Marseilles, mentioning any towns (named) which would be passed.

6. What would be the natural port for shipment of goods to the Suez Canal from Lyons, Vienna, Southern Russia, Milan, Belgrade?

7. Where are the four most noticeable red patches of high population in Europe? Can you give reasons?

B 1. What navigable waterways in Scotland and Ireland are not marked in the top map?

2. With what rivers is the Rhine connected for barge traffic?

3. Name the navigable rivers of Continental Europe.

4. What rivers of Russia are connected by canals?

5. The great peninsulas of Europe have hardly any navigable rivers. Why is this?

6. There is a network of canals in Northern France round Lille. They cannot be shown on this scale. Can you account for their existence?

7. At what Mediterranean ports would a coasting steamer touch on a voyage from Gibraltar to Constantinople?

8. Can you account for the fact that Italy is much more regularly peopled than Spain or Scandinavia?

9. Account for the fairly thick population between the middle courses of the Dniester and Dnieper.

C 1. Name the chief manufacturing, the chief ore-exporting, and the most noticeable non-manufacturing countries in Europe.

2. What port in France would naturally have most trade with Africa and China?

3. By what means could a Russian army be transported to the Afghan frontier? What town in Afghanistan would it first threaten?

4. Describe a journey from Constantinople to Merv, mentioning chief towns and most noticeable industries on the route.

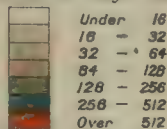
5. Of what advantage would a railway from the Bosphorus to the Persian Gulf be? Are there any natural difficulties in its way?

6. Account for the great population near the mouth of the Nile, for the lack of population in Northern Scotland and north of the Caspian Sea.

7. What country in Europe would you pick out as being capable of the greatest commercial improvement? What causes have hindered its development up to now?

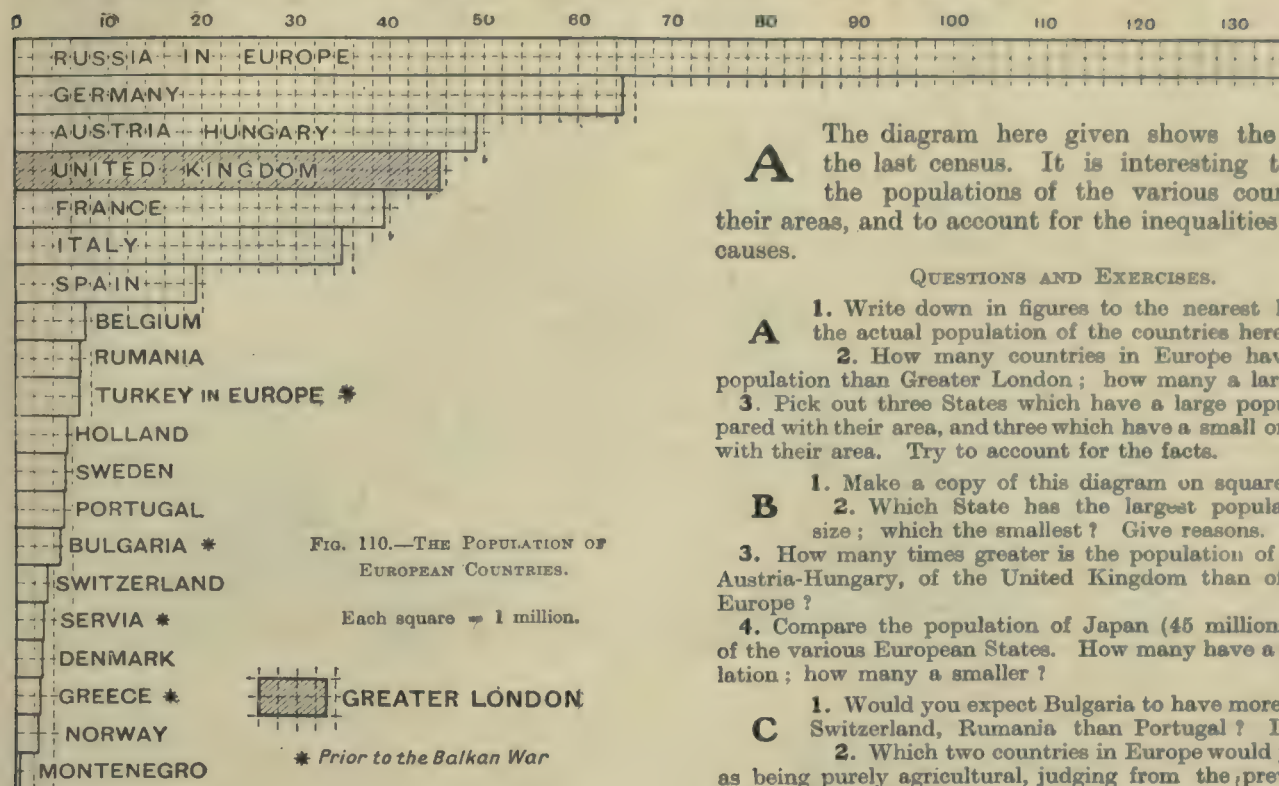


Inhabitants to Sq. Mile
exclusive of Large Towns



• Towns of 50 - 100,000 inh.
 ■ " " 100,000 "
 (Several omitted in Great Britain for want of space)

Comparative Population of European States.

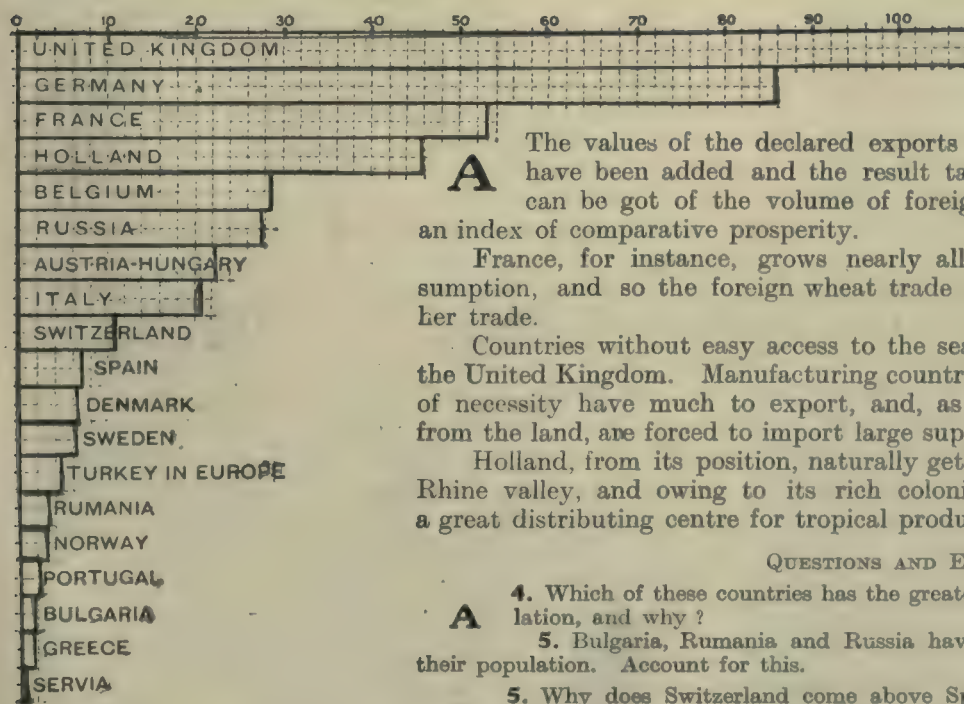


A The diagram here given shows the results of the last census. It is interesting to compare the populations of the various countries with their areas, and to account for the inequalities by natural causes.

QUESTIONS AND EXERCISES.

1. Write down in figures to the nearest half million, the actual population of the countries here tabulated.
2. How many countries in Europe have a smaller population than Greater London; how many a larger?
3. Pick out three States which have a large population compared with their area, and three which have a small one compared with their area. Try to account for the facts.
1. Make a copy of this diagram on squared paper.
2. Which State has the largest population for its size; which the smallest? Give reasons.
3. How many times greater is the population of Russia than Austria-Hungary, of the United Kingdom than of Turkey-in-Europe?
4. Compare the population of Japan (45 millions) with that of the various European States. How many have a larger population; how many a smaller?
1. Would you expect Bulgaria to have more people than Switzerland, Rumania than Portugal? If so, why?
2. Which two countries in Europe would you pick out as being purely agricultural, judging from the previous maps; which two largely manufacturing?

Comparative Foreign Trade of European States.



A The values of the declared exports and imports of each country for 1902 have been added and the result tabulated above. Thus a rough idea can be got of the volume of foreign trade. This must not be taken as an index of comparative prosperity.

France, for instance, grows nearly all the wheat required for home consumption, and so the foreign wheat trade hardly helps to swell the volume of her trade.

Countries without easy access to the sea naturally do less foreign trade than the United Kingdom. Manufacturing countries such as Great Britain and Belgium of necessity have much to export, and, as much of their energy is taken away from the land, are forced to import large supplies of foodstuffs.

Holland, from its position, naturally gets much of the enormous trade of the Rhine valley, and owing to its rich colonies in the East Indies, has become a great distributing centre for tropical produce.

QUESTIONS AND EXERCISES.

4. Which of these countries has the greatest volume of trade compared to its population, and why?
5. Bulgaria, Rumania and Russia have very small foreign trade compared to their population. Account for this.
5. Why does Switzerland come above Spain, Sweden and Denmark above Turkey-in-Europe?
6. Write a list in figures (to the nearest five millions) of the actual volume of trade of these countries.
3. Account for the comparatively high place taken by Switzerland in this table, and for the low place taken by Italy.
4. How do you account for the fact that of late years Germany has been rapidly gaining on the United Kingdom in volume of foreign trade?

FIG. 111.—COMPARATIVE TRADE DIAGRAM OF EUROPEAN STATES.

Total Annual Value of Imports and Exports combined (average of the last three years available). Each square £10,000,000 in value.



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FIG. 112.—PARIS.

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Looking west down the Seine. The river is here split into two by the island, upon which the near buildings on the left are built. The group of buildings with three round towers, a dome, and a chapel with high-pitched roof and spire, are the Law Courts (Palais de Justice). The Eiffel Tower and "Arc de Triomphe" are conspicuous in the distance. The group of towers just below the latter are part of the Tuileries, the old palace of the French kings; most of which is now used as the splendid Art Museum of the Louvre. Does the fact that at this point there is an island in the Seine account for the choice of this site for a town? Think of defence, and difficulty of bridging wide rivers. Would you expect to find most of the very old buildings on the island? Paris is now the head of navigation for sea-going steamers. Can they get up this branch?

France and Iberian Peninsula. Structure, Climate and Vegetation.

A These three countries, France, Spain, and Portugal, lying on the south-west of Europe, and exposed to the benefits of the ocean, are naturally among the richest on the continent from a producing point of view. At first sight it would appear that a sufficient rainfall would be certain throughout this region. Its distribution, however, is governed by the arrange-

ment of mountain and plain, and also by the nearness of the great African continent to Southern Spain.

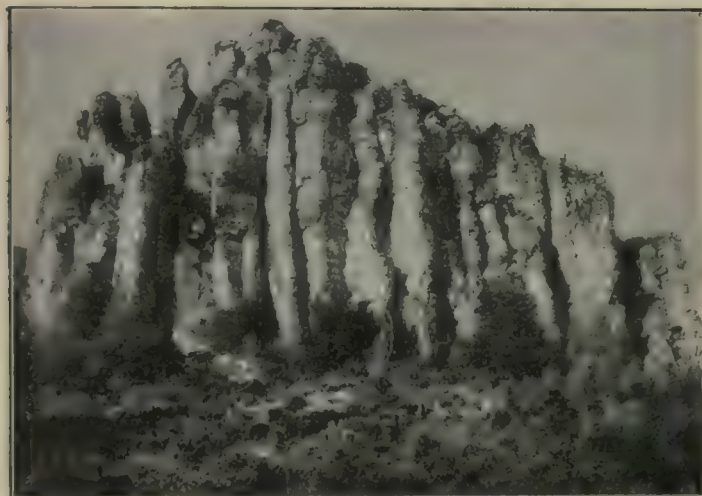
From a glance at Plate 28, it is obvious that France is a comparatively flat country, except in the south-centre, where the mass of the Auvergne, with its remarkable extinct volcanoes, gradually rises up in a great plateau, to fall abruptly under the name of the Cevennes along the line of the Rhone.

Bordering the eastern boundary of France, there is a great barrier of mountains and hills with gaps here and there; for instance, where the Rhone issues from Switzerland, at the Burgundy Gate between the Jura and Vosges, and again along the Belgian frontier. The result of the general configuration is that rainfall is fairly evenly distributed throughout France (see Plate 26), that a very small proportion of her surface is unproductive (chiefly in the Central Plateau), and that her rivers are generally navigable and well supplied with water. As a wheat-producing country France is only beaten by the United States and Russia; as a maker of wine she is unrivalled.

No more striking example of the results of the configuration of the land surface could well be found than by a comparison between France and Spain.

The Iberian Peninsula may be said to consist of a great central plateau, made up largely of horizontal layers of very ancient rock. This is joined on the north by an extensive series of comparatively new fold-mountains, including the Pyrenees and the mountains of Cantabria, barring it effectually from France and the Bay of Biscay.

On the south-east again, starting from Cadiz, another and even higher system of earth-folds extends eastward and continues beyond the coast-line into the Balearic



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FIG. 113.—BASALTIC ROCKS IN THE AUVERGNE.

A large area in the Auvergne consists of extinct volcanic rocks. Cinder cones and lava flows can often be distinguished. Notice the rough columnar structure in this volcanic mass. Compare with Giants' Causeway (page 2).

Islands. The valley of the Guadalquivir divides this from the great central tableland. One result on the rainfall is that it is most unevenly distributed. The rain-bearing winds from the Atlantic are raised and cooled along the western edge of the plateau, and are forced to part with most of their moisture in Portugal, and on the northern chains of mountains, while they pass over the centre as comparatively dry winds.

The rivers are therefore not well filled as a rule, and in breaking their course downwards past the edge of the plateau become rapid and unnavigable. The map will show that the Ebro and Guadalquivir have a much less violent course than other Spanish rivers, and are therefore partially navigable. Their volume is, however, too small usually for anything but quite light vessels, and the Ebro has an awkward delta.

The average height of Central Spain, nearly 3,000 feet, prevents luxuriant vegetation even where the rainfall is sufficient.

In the summer time the intense heat over the Sahara causes a low-pressure area there, and so the winds are drawn strongly from all Southern Spain towards the Mediterranean. The result, of course, is a great lack of rain throughout that region. Wherever irrigation has been successfully introduced along the coast strips, magnificent results have been obtained. Hence come the oranges and grapes and raisins of Malaga, Murcia, and Valencia.

The dry summer and cold winter of the central mass is often favourable to wheat growing; and the country round Valladolid may be called the granary of Spain.

In most parts of the peninsula, where favourable low slopes are found, as the plateau begins to rise, the vine flourishes and produces the famous wines of Portugal (port), Andalusia (sherry), and Catalonia.

Besides the wheat-growing area above-mentioned, there are in the peninsula several other agricultural regions, viz. the lowlands along the coast of Portugal, the valleys of the Guadalquivir and Ebro, and the narrow coastal strip along the Mediterranean, famous for grapes and oranges.

Much of the rest of the country is a more or less barren tableland. The heavy rainfall of the north-west there makes cattle-rearing a chief industry.

More than half of the entire surface is uncultivated.

B When it is realised that the great basins of the Loire and Garonne lie open to the west, while that of Paris is partially shielded by the hills of Normandy and Brittany, that the Rhone valley is too narrow to form a dry region except near its delta, it is easy to see why the driest parts of France are round Paris and along the Mediterranean coast strip. The long tap-roots of the sugar beet and of wheat make these crops suitable to the valley of the Seine, while the greater heat of the lower Rhone valley enables olive culture to be successful. The rainier hill country of Normandy and Brittany is famous for horses, cattle, and dairy produce, just as parts of the Central Plateau and the slopes of Alps, Jura, and Vosges, are rich in wool, and cheese, and cattle. The Garonne valley is naturally fitted for almost all kinds of agriculture, which is most successfully followed in the rich plain round Toulouse.

The position of the vineyards in France can be seen from

the lower map on Plate 23. The most famous wines come from the Marne valley south of Reims (champagne), from the Loire basin (saumur), from the valleys of the Dordogne and Garonne (claret), and from the slopes of the Saône near Dijon (burgundy).

From the same map the position of the vineyards of Spain and Portugal can be seen at a glance.

Their importance can be gauged from the fact that 40 per cent. of the value of the exports of Spain is made up of wine. Much of the red wine finds its way to Bordeaux, to be sent on to the outside world as French claret.

As much as 2 per cent. of Spanish soil is taken up by plantations of olives, chiefly found in the Guadalquivir valley. Along the Tagus in Portugal they are also largely cultivated.



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[Mrs. A. Le Blond.

FIG. 114.—MOORISH ARCHITECTURE IN SPAIN.

How do the arches, pillars and style of decoration resemble or differ from any other kind of architecture known to you? Of what material do you suppose the pillars, capitals, tower and upper parts of the walls are made as far as can be seen? Moorish decoration hardly ever represents any living creature. Can you account for this? When were the Moors expelled from Spain? How long had they been dominant there? This is from a mosque in Cordova. Locate the place in the map. Describe its position.

C Most of France is suited to the growth of trees, but these are naturally only allowed to grow in swampy or hilly regions which are not valuable for agriculture. Thus forests are found in patches almost all over France, with the exception of the higher parts of the Central Plateau and of the Alps, and in the hills of Brittany. The mountain slopes of the eastern border are naturally well covered with pine trees, and with chestnuts in the south. The dry sandy region of the Landes, between the Garonne and the sea, has been successfully planted with pines.

Maize is important as a crop in many parts, especially in the valleys of the Adour and the upper Saône. Mulberry trees are common along the Rhone between Lyons

and the sea, and help to supply the looms of that great city with silk. How is raw silk obtained?

The apples of Normandy, and the hemp and flax of the extreme north are worthy of mention.

Forest Productions.

Along the western edge of the Iberian tableland, trees naturally flourish, chestnuts and oaks being the most valuable. The bark of a species of oak from Portugal supplies most of the world with cork, which substance, when broken small, enables grapes to be safely packed for the British market.

The Balearic Islands naturally have a similar vegetation to the Mediterranean coast strip, and produce, besides cereals, large quantities of oranges.

Minerals and Manufactures.

A The manufacturing districts of France lie chiefly east of a line drawn from Havre to the Lion Gulf. While iron is plentiful in many parts of France, coal is found only in a few scattered fields, the most valuable being along the Belgian frontier. Hence spring the great iron manufactures of Lille, and the woollen and linen industry of the Roubaix district.

The easy navigation of French rivers, and the splendid system of canals, have enabled British, German and Belgian coal to be cheaply supplied to the cotton industries of Rouen, to the upper basin of the Moselle, and to the district where the Rhine and Rhone Canal enters Burgundy.

The easy accessibility of Paris has made it a centre of various mixed manufactures, such as paper, porcelain, and clothing.

B The local supplies of coal have enabled le Creusot to become a centre of machinery-making, and to be famous for its cannon. Likewise St. Etienne has become a great silk-weaving centre, and is also able to provide Lyons with coal for a similar purpose.

C Among minor industries may be mentioned the chemical and soap manufactures of the Marseilles district, made possible by local supplies of salt and the vegetable oils of tropical Africa and the Far East; the cane-sugar refineries of Nantes and Bordeaux; the beet-sugar making of the North; the woollen industry of Reims.

Foreign spellings: Marseille, Lyon, Bretagne (Brittany), Bourgogne (Burgundy).

QUESTIONS AND EXERCISES.

- A** 1. Make a list of all the rivers, marked in brown, with their symbols, from the next map, and be ready to repeat the names from the Test Map.
2. Do the same for parts of the sea, islands, and mountains.
3. Do the same for towns.
4. Write down the chief ports marked in the map.
5. Give the three chief French naval stations, and one British in the south of Spain.
6. Name the most westerly and the most southerly cape in Europe.
7. What rivers would you cross in order in a journey by rail from Paris to Lisbon, from Lisbon to Marseilles?
8. What important towns would be passed in a railway journey from Havre to Nice, from Calais to Basle (Basel)?

9. Give two towns on the Riviera, two on the Seine, two on the coast of Portugal.

10. What parts of these three countries receive a heavy annual rainfall; what parts a light one? (See Plate 26.)

11. Is there any part of France marked on Plate 26 as having "Scant Vegetation"? Is much of Spain so marked? Account for this.

12. What are the vegetable products of these countries there marked?

13. Look at the maps on Plate 25, and give the average July temperature of Lyons and Bordeaux; the average January temperature of Marseilles, Cherbourg, and Lisbon.

14. What are the three routes marked between England and France?

B 1. Write down, with their symbols, the rivers, towns, islands, capes, and mountains, which are marked in blue or brown, and be ready to repeat these from the Test Map.

2. Do the same for all the provinces of France and Spain.

3. Mention three towns in France on or near coalfields.

4. On what rivers, or tributaries of what rivers, are Orleans, Toulouse, Nantes, Amiens, Grenada?

5. Mention four famous French wines, and say from what districts they come.

6. Between what two towns are the following, if you go along the lines of rail: Dijon, Jerez, Orleans, Amiens, Biarritz?

7. Say to what places the steamer routes are marked from Havre and Marseilles.

8. What three towns export wine?

9. Draw a map of France with these co-ordinates: N.W. corner of inner frame (-4.3, 3.4), N.E. corner (4.7, 3.4), S.W. corner (-4.3, -3.8), S.E. corner (4.7, -3.8), Brest (-3.8, 1.4), Cape de la Hague (-2.2, 2.5), Havre (-1, 2.2), Calais (0, 3.4), Orleans (-1, .8), Nantes (-2.1, .3), Bordeaux (-1.6, -1.9), Biarritz (-2.2, -3), Toulouse (-.5, -2.9), Paris (-2, 1.6), Basle (3.2, .7), Lyons (1.7, -1), Marseilles (2.1, -3.1), point near the Pyrenees where Mediterranean coast cuts frame of map (-6, -3.8), Genoa (4.2, -2). N.B.—Take origin near centre of your paper. Then find the four corners of the frame and rule this in. Then plot in and name the points given, and sketch in outline and rivers from the map on Plate 28. On inch paper this will give a map on the scale of 1 : 5,000,000.

C 1. Write down, with their symbols, the names of all the towns, rivers, islands and peaks which are marked, and be ready to repeat these from the Test Map.

2. Write down all the naval stations marked, saying to what nation they belong.

3. Name the towns which would be passed in a railway journey from Cologne to Calais, Calais to Lisbon, Lisbon to Marseilles, Marseilles to Havre.

4. Look at the maps on Plate 25, and say why there is high pressure over Spain in winter. What result does this have on rainfall? Why does the Ebro valley receive a small rainfall?

5. How would you describe generally the position of the chief metal-producing regions, manufacturing districts, and coal-fields of Spain and France?

6. How far is the distribution of population (as shown on Plate 27) determined by the answer to question 5?

7. Make a map of Spain as follows, by means of a protractor and ruler. Rule a frame 9 inches from W to E by $7\frac{1}{2}$ inches. Take a point near left top corner $\frac{1}{4}$ inch below top side of frame and $1\frac{1}{2}$ inches to the right of the left side of frame. Call this point A, and name it Cape Ortegal. Similarly near left lower corner take a point $\frac{1}{4}$ inch up and $2\frac{1}{2}$ inches from the left. Call this B, and name it Gibraltar. At the point A on the west of the line A B make angles of 21° and 27° , at B angles of 58° and 36° . Where the arms intersect will give the position of Cape St. Vincent and Cape Da Roca. On the east of the line make at A angles of 73° , 70° , 38° , and 19° ; at B angles of 33° , 57° , 71° , and 90° . The points of intersection of the arms will give the position of the boundary between France and Spain on the Bay of Biscay and the Mediterranean, and the two prominent capes in the south-east, one opposite Ivica, the other near Almeria. From these points sketch in the outline and chief rivers. Shade in pencil the parts over 1,200 feet, and then fully name the map as on Plate 28. This will give a map on a scale of 1 : 5,000,000.





Central Europe.

Germany, Austria-Hungary, Belgium, the Netherlands, and Switzerland.

Natural Divisions.

A The above countries form the core of the European continent and serve to connect the Peninsulas of the West and South with the great interior plain of Russia.

If the eastern frontier of France is taken as the western limit, and the line which joins the Baltic and Black seas as the eastern, the natural unity of Central Europe can easily be realised.

Physically it falls into three natural divisions: (1) the well-defined mountain regions of the Alps, and Carpathians; (2) part of the great European plain to the north, bordering the North Sea and the Baltic, and merging towards the east into the vast Russian lowland; and (3) the intervening hilly country of the southern half of the German Empire, and Bohemia.

Of these the first division may be said to consist generally of great fold-mountains, with cores of very ancient rock, often crystalline and igneous, and edges consisting of newer sedimentary formations.

Between the curving Carpathians and the Alps there is included the wide plain of the middle Danube. The eastern portion consists of the Hungarian steppe, rich in corn and famous for its horses and cattle. The western half of the basin is considerably more varied in appearance, and has much woodland and agriculture intermingled. All round the interior slopes of the Carpathians is a girdle of vineyards.

The second, lowland, region is covered with quite recent soft formations. The underlying and more ancient rocks are reached only by deep borings for coal or salt.

The third, hilly, region consists largely of block mountains and tablelands, thrust up between well-defined lines of fault. Their surfaces are of course much worn and rounded, and often covered with forest.

B The third of these natural divisions, that which lies between the Alpine regions and the lowlands of the north, appears most complicated on the map. It can, however, be fairly easily explained geologically. The well-defined area of Bohemia may be looked upon as a very ancient mass of rocks, the core of Central Europe. This has been partially covered to the north by newer formations, as evidenced by the coal measures west of Prague.

There now remains the region included within the following boundaries. Its southern limit is the line up the Danube from Ratisbon continued onwards south of the Black Forest to Basle. From Basle a line must be imagined curving round the southern extremity of the Vosges, then northwards along the Meuse to Liège, its western boundary. The line between Liège and Magdeburg divides it clearly from the plain to the north. From Magdeburg the eastern boundary runs through Chemnitz to the western corner of Bohemia, and then on southwards to Ratisbon.

Generally speaking, this may be considered as consist-

ing of a central basin of Triassic Sandstone, with much rich soil resembling the great midland plain of England. This is broken to the south by the much older mass of the Vosges and Black Forest, between which runs the Rhine in a well-marked rift-valley. Towards the north-east again there rise the more ancient blocks which make up the cores of the Thuringian Forest and Harz Mountains. Again, in the regions to the east and west of the Rhine Valley, at Aix-la-Chapelle, there are several areas of comparatively recent volcanic rocks.

C Nearly all the lowland of Northern Germany, which slopes towards the Baltic, is covered with a thick glacial deposit, the remains of the ice-sheets which extended at various epochs from the Scandinavian highland, covering the region where the Baltic now is, and reaching nearly as far towards the south-east as the line of the Elbe. The result is that the older rocks have been ground down and covered over, and the country has been left comparatively level.

Much of the soil is made up of rich clay deposited by the receding ice. The irregular drainage of this stretch of country, and its vast number of lakes, are among the results of the glacial action.

Between the Elbe and the Zuyder Zee, the lowland is quite different in character. There are no lakes, no rich soil, but a series of bogs and moorlands. Though much has been done by patient labour to reclaim these naturally forbidding lands to the plough, the population of this part of the lowland is comparatively scanty.

Industries and Pursuits.

A Within the area here treated are to be found the greatest centre of manufacturing industry in Europe due to the rich coal-fields of Belgium and the lower Rhine, the "*playground of Europe*" in Switzerland and the Tyrol, and one of the chief wheat-growing areas of the world in the plain of Hungary.

The coal-fields naturally determine the positions of the great manufacturing centres; for example, in Saxony, Southern Silesia, and Northern Bohemia. In all these districts there is naturally a considerable textile industry, largely depending upon imported cotton. Native products, however, enable Germany to take first place in the manufacture of zinc and chemicals. Throughout the North German plain inexhaustible supplies of rock-salt have been found by boring, and round Magdeburg potassium beds of still greater economic value.

Agriculture throughout Hungary is by far the most important industry, also in Austria, with the exception of Northern Bohemia. In the German Empire as a whole, Holland, and Switzerland, it is of about equal importance to the pursuits of manufacture and commerce. In Belgium and Saxony considerably more than half the population depends upon manufacture for subsistence.

Generally speaking, Holland and Denmark may be looked upon as grass countries, North Germany as a land of potatoes and rye, Central and South Germany and Bohemia as a rich region of mixed agriculture—wheat, hops, and barley being the leading products; Austria-Hungary as being especially suited for the growth of wheat and maize.

B Iron-ore is very widely distributed over Central Europe, but, as a rule, it is only worked successfully when found near coal. The most extensive bed of ironstone in Europe is to be found along the Moselle from Luxemburg southwards, the extraction of which is shared by France, Luxemburg, and Germany. Though not immediately on a coal-field, it is surrounded at no very great distance by supplies of fossil fuel. Other supplies are obtained from Hanover and Brunswick.

The most remarkable iron district in Europe is to be found between Trieste and Graz. Here the great purity of the ore enables it to be worked although far from coal. Bohemia has a large production of pig-iron. Moravia and Transylvania are also rich in native ore. Among the coal-producing regions of the world, Central Europe is surpassed only by Great Britain and the States. Besides true coal, vast beds of lignite are found, especially in the middle basin of the Elbe.

The distribution of vineyards can be easily seen from the map on Plate 26. Hock and Moselle are famous products of the Rhine basin. Lower Austria, Dalmatia, and the district round Tokay in Hungary, may be mentioned as valuable wine-producing regions.



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FIG. 115.—VINEYARDS IN SUMMER.

The view was taken in a valley of a small western tributary of the Rhine, about thirty miles due south of Cologne. This is the common method of growing vines in France, and other parts of Europe. Notice that the vines are trained on poles somewhat like hops (see photograph on page 34), very often on terraced slopes facing south. The scenery is typical of well worn valleys in ancient rock. These hills are part of the Eifel range which merges into the Ardennes. Locate the position of this valley on the map, Plate 30. How far is it from the Belgian border? What is its latitude? Why don't the vineyards extend to the higher parts of the hills?

C The amount of gold produced within this region is insignificant compared to the output of South Africa, Australasia, and North America. The Transylvanian district is by far the most important.

Before the development of the enormous silver deposits of America, Germany was one of the most successful producers of this metal. Now its production is confined almost entirely to Saxony.

American copper has in the same way almost monopolized the German market. Less than a quarter of the amount used is produced at home.

The mercury mines of Carniola are surpassed only by those of Spain and California.

Foreign spellings: Köln (Cologne), Aachen (Aix-la-

Chapelle), Vlissingen (Flushing), Pfalz (Palatinate), Sachsen (Saxony), Nürnberg (Nuremberg), Schlesien (Silesia), Preussen (Prussia), Pommern (Pomerania), München (Munich), Bayern (Bavaria), Böhmen (Bohemia).

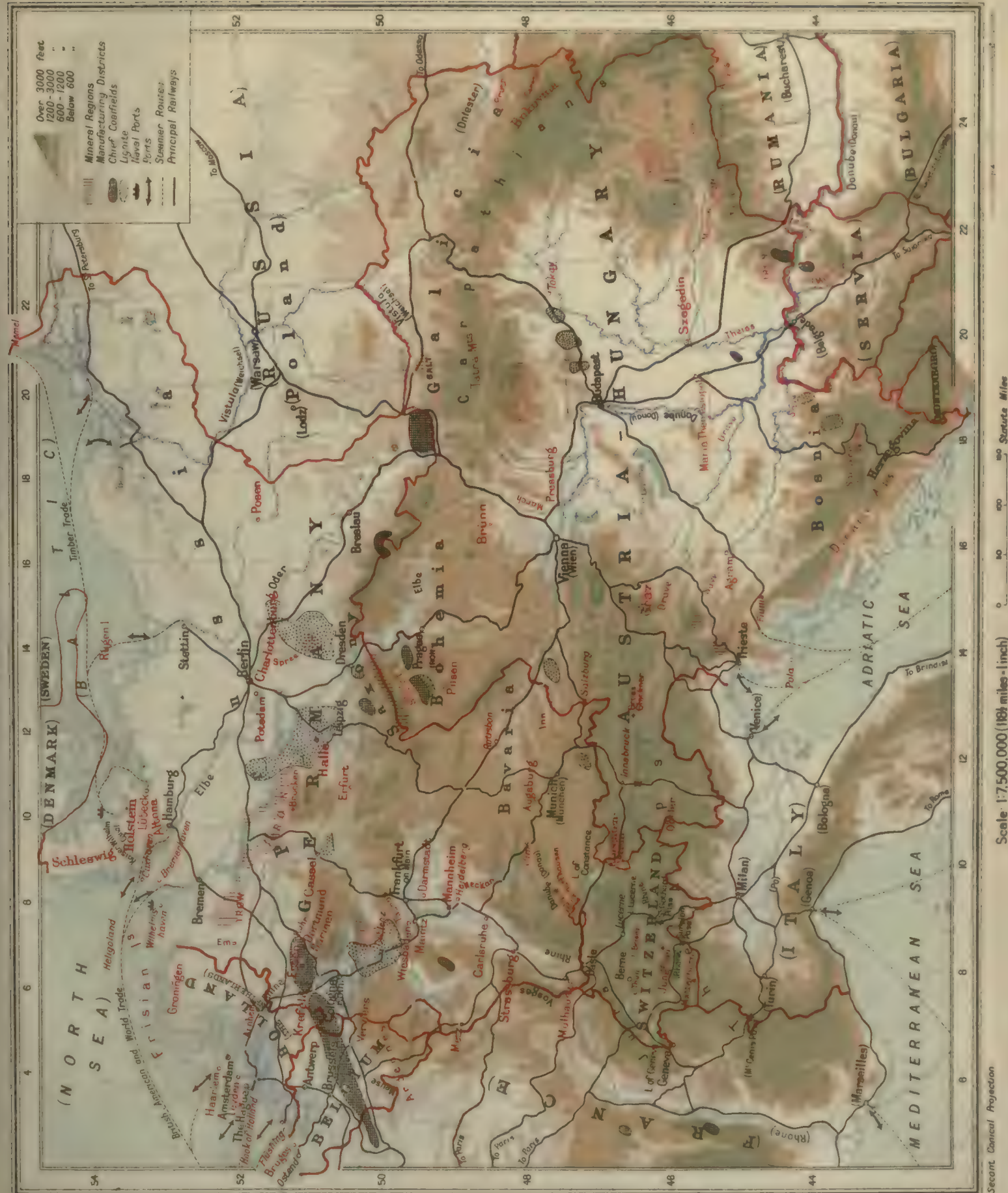
QUESTIONS AND EXERCISES.

- A** 1. By what countries is the German Empire bounded on its various sides?
2. Write a list (with symbols from Plate 31) of all the rivers, lakes, and mountains which are marked in brown, and be ready to write or repeat them from the Test Map.
3. Do the same for towns. On what principle are they numbered?
4. Upon what rivers are Cologne, Vienna, Budapest, Breslau, Bremen, Hamburg, and Geneva?
5. Name the chief ports of Belgium, Holland, Germany and Austria. Name the canal between the North Sea and Baltic.
6. Where are the chief coal and lignite fields?
7. What river valleys would you traverse, and what towns would you pass, on a railway journey (1) from Stettin through Bohemia to Belgrade, (2) from Geneva to Vienna?
8. What are the four ports which take most of the traffic of Central Europe to the Suez Canal?
9. Make a tracing of the map on page 66, marking the boundaries between countries by heavy black lines, and the boundaries of political divisions in your section by dotted lines, namely, Prussia (I), Austria (II), Bavaria, Saxony (kingdom), Hungary, Bosnia, Alsace-Lorraine, and Galicia. Mark in each the proper symbol, and use as a test map.
10. Place this tracing over the named map on Plate 30 and say in what divisions are Munich, Dresden, Budapest, Stettin, Trieste? What are the chief rivers of Galicia, Bohemia, and Bavaria?
11. The numbers in the map are given in order of population. What is the most populous division of Austria; of Prussia?

- B** 1. Make a list (with symbols from Plate 31) of all rivers, mountains, lakes, and parts of sea, marked in brown or blue, and be ready to write or repeat them from Test Map. (Aix-la-Chapelle ought to be placed 30 miles due west of its position on the Map.)
2. Do the same for towns.
3. Upon what rivers are Magdeburg, Antwerp, Bremen, Bern, and Düsseldorf?
4. Name the river valleys traversed, and the chief towns passed, by a railway traveller from Rotterdam to Vienna, from Hamburg to Lemberg, from Milan to Cologne.
5. Account for the importance of Elberfeld, Vienna, Antwerp, Chemnitz, Hamburg, Trieste, Dresden, Liège.
6. Make a tracing of the map on page 66, as explained in question 9 above, adding the boundaries of the political subdivisions named in your section (Württemberg, Hesse, etc.). Insert the appropriate symbols, and use as a test map.
7. Place the above tracing over the named map, and write down in what divisions are Stuttgart, Berlin, Cologne, Nuremberg, Lemberg, Hanover, Brenner Pass.
8. By what passes does the railway go between Geneva and Milan, Basle and Milan, Zürich and Innsbrück, Innsbrück and Italy?

[Liechtenstein is an independent Principality, but belongs to the Austrian Customs Union. Its population of about 10,000 pays no taxes, and is not liable to military service.]

- C** 1. Write down a list of all rivers, mountains, lakes, islands, and peaks, with their symbols, and be ready to repeat or write them from the Test Map.
2. Do the same for all towns. Arrange them by countries.
3. What are the ten most populous towns mentioned?
4. In what parts of Central Europe are coal, iron, and gold found?
5. Where are the chief centres of industry? Account for their growth.
6. Name the naval ports of Germany.
7. Write a list of the lakes and peaks of Switzerland, with symbols.
8. Make a tracing of the map on page 66, filling in all boundaries. Mark in all symbols, and bring it up as a test map.



CENTRAL EUROPE.—Test.

31



9. Place the tracing over the named map, and write down, where possible, the names of two towns in each political division. Treat the Thuringian States as one division. Do not attempt to mark or learn the positions of these small states. The names are given for reference only.

10. Name the divisions in which are contained detached portions of Oldenburg and Prussia.

11. What Duchies or Grand Duchies appear as islands in Prussian territory?

12. Name in order of population the three free cities, the three most populous divisions of Prussia, of Austria, and of Thuringia.

13. Saxony and Silesia are each divided into two political divisions. Say how.



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FIG. 116.—SALSBURG.

[Photochrom Co. Ltd.

Find Salsburg on the map (in Austria). What is its approximate latitude? Is it nearer the equator than London? Would you expect a cold winter at this place? To what natural feature does the town owe its origin? Of what mountain range are these the beginnings? Into what great river must this water eventually find its way? Judging from the position of the church, which is the east in the picture?

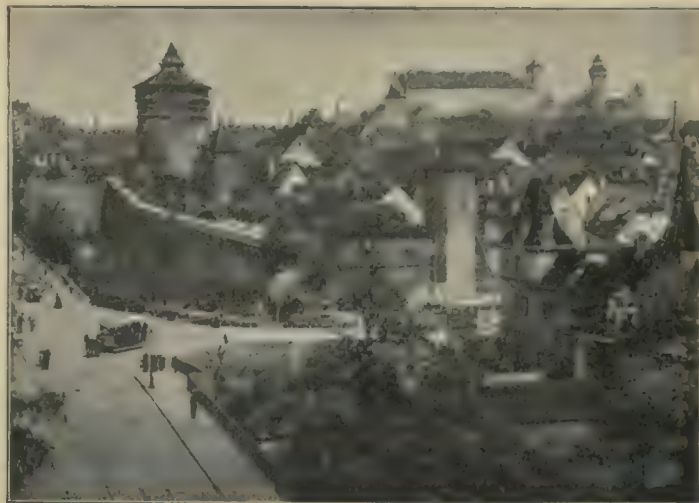


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FIG. 117.—ANTWERP.

[Photochrom Co., Ltd.

What river is this? Notice the alluvial plain, the wide navigable river, the steamers at the wharves, the sheds for storage of goods, the mediaeval architecture, showing the long lease of prosperity enjoyed by this town. Why is it an important rival of London as a distributing centre for Europe?



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FIG. 118.—A TYPICAL OLD GERMAN TOWN.

This town is in latitude $49^{\circ} 30'$ N. and in longitude 11° E.; what is it? On what river is it, and in which state? Why is its geographical position so important? Notice the old town-wall and ditch, the round towers at the gateways, and the castle on the highest point. In one of the old houses in the picture there lived the great artist-engraver Albrecht Dürer.



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FIG. 119.—BUDAPEST.

Of what state is this the capital? What river is this? Judging from the shadows, about what time of day must it have been when the photograph was taken? Is the south to the right or left of the picture? Which way is the stream flowing? Are you looking at Buda or Pest? (Buda is on the west bank.) If you went for 100 miles to the south-east, would you meet any hills? Do you see any signs of river traffic? Is this a suspension bridge? Why is it put at a high level?



FIG. 121.—SWITZERLAND AND THE ALPINE PASSES.

The map can be made clearer by painting a light wash of brown over the area above 9,000 feet, of blue on lakes and sea, and by marking railways in red ink.

Western and Central Alps.

The above map is designed to show the chief passes of importance, the great international railway routes, and the position of the best known tourist resorts and mountains. Only those names which do not occur elsewhere have symbols attached to them. The new peaks are thus labelled: P 1, P 2, etc., according to height. Below the 3,000-feet contour agriculture is possible; trees flourish well up to the 6,000-feet line, above 9,000 snow lies throughout the year.

Switzerland can roughly be divided into three natural divisions: (1) The Jura, a folded limestone range covered with trees and pastures, celebrated for its special trade of watch-making. (2) The plateau of Switzerland running north-east from

the Lake of Geneva to the Rhine, containing nearly all the agricultural land. Wheat, wine and cheese are the most important products. (3) The Alpine regions, where every available spot that can be used for tree-growing or pasture is made the most of by the energetic inhabitants. Only about one-twentieth of the entire country is above the line of perpetual snow and ice.

The importance of railways across the Alps consists in the links which they make between the great trade-centres of Europe and the Mediterranean. The enormous traffic of the Rhine valley required a connexion between Basle and Genoa. Of the two routes now open, the St. Gotthard is the more direct, but the Simplon is at a much lower level (2,000 feet as opposed to 3,500 feet), and hence the haulage of trains is cheaper.

Marseilles is the natural Mediterranean port of France, but there is also a stream of traffic from Dijon to Genoa. The weak point in the route from France to the Simplon is the high railway over the Jura; this can be improved by a tunnel. Another scheme is to make a direct route from Dijon to Geneva under the Jura, up the Chamonix valley, beneath Mont Blanc, and so on to Genoa.

The Brenner is far the lowest pass, and was the first to have a railway over it. The Mont Cenis was the next Trans-Alpine railway, and is the route taken by the "Rome Express" from Paris.

QUESTIONS AND EXERCISES.

A 1. Trace the map, indicating the sea coast, and marking and naming all the towns in heavy print. Shade in pencil all land over 6,000 ft., and mark the three Trans-Alpine railways to Genoa, and the line from Basle to Venice (via the Brenner).

(Or, instead of naming, insert symbols from the map of Central Europe, and use the result as a test map.)

2. What are the three main divisions of the Alps here named? What are the passes which divide the groups?

3. In journeys from Dijon to Genoa via (1) Lucerne, (2) Lausanne, (3) Mt. Cenis, (4) Marseilles, through what towns and passes would a traveller go?



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FIG. 122.—THE MATTERHORN.

The summit is nearly 15,000 feet above sea-level. At what height is the tree-line in Switzerland? From what height at least must the picture have been taken? In what division of the Alps is this? Give the approximate latitude from the map. Why does a cloud often form against the mountain-side? Do you see any signs of ice action here? How do you suppose the small lake has been formed? Why is the mountain itself comparatively free from snow? Of what material is the slope, which is to be seen on the right of the mountain beginning about half way up, composed?

B Geologically the Alps may be said to consist of a core of crystalline rock, occupying most of Southern and Eastern Switzerland, round the edges of which are to be found intensely folded limestone mountains, which are best developed along the northern border. The Swiss plateau consists of newer sandstone rocks, covered over largely with glacial deposits. The Jura mountains may be looked upon as a repetition of the limestone Alps on a smaller scale, the same rock beds reappearing in a fresh series of great folds. After the glacial period, a general subsidence of the entire region must have taken place to account for the elongated lakes or drowned valleys which are so common on both sides of the Central Alps.

QUESTIONS AND EXERCISES.

- B** 1. Trace the map as directed above (A, question 1), but add the additional names for your section.
2. What are the two divisions here marked of the Central Alps? Say what river systems they separate.
3. What effect have the Trans-Alpine railways had upon the

prosperity of Marseilles, Genoa, and Venice? How has the opening of the Suez canal helped?

4. Would a railway from Berne direct to the Simplon be of advantage? What obstacles are there in the way?

C 1. Make a tracing of the map, marking in carefully all river courses and lakes. Shade in pencil all land over 6,000 ft. Mark the railways in red ink. Put symbols instead of the names where these are given. (Eight towns, six passes, five peaks, one lake, one mountain group.) Use the result as a test map.

2. Make a list of all the lakes named in Switzerland and Italy.

3. Name what river-basins are connected by each of the passes mentioned.

4. Write a list of all the peaks named, saying to what mountain group each belongs.

5. Draw a diagram on squared paper to show the comparative heights of these peaks (let one division = 500 feet vertically): Mont Blanc (15,700), Monte Rosa (15,200), Matterhorn (14,700), Jungfrau (13,700), Finsteraarhorn (14,000), Bernina (13,300), Pilatus (7,000), Rigi (6,000).

Foreign spellings: Genève (Geneva), Lac Léman (Lake of Geneva), Basel (Basle).

Italy and the Balkan Peninsula.

Natural Divisions.

A The Alps form the natural boundary to the north of Italy, the line from Fiume along the Save and Danube to the Black Sea may be taken as the northern limit of the Balkan Peninsula. (Rumania is dealt with here, though it physically belongs to the plains of Southern Russia.)

South of these limits, each of the peninsulas can be divided into three parts.

1. The Half-continental region, consisting in Italy of the plains of Lombardy; in the Balkan Peninsula, of the interior part of the triangular mass of land between the Danube and Greece.

2. The Peninsulas proper.

3. The Islands.

B Geologically there are many points of similarity between the two peninsulas.

The Apennines are a continuation of the folded Alps. They consist of clay and limestone, and are of comparatively recent age, and therefore Italy has no coal and but little mineral wealth. Sicily is formed by a continuation of this fold-system. Sardinia (and Corsica) and Elba, on the other hand, are the remains of an ancient rock-mass now chiefly submerged, and contain many valuable mines of lead and zinc and iron.

In a similar fashion the great folds which form the limestone region of the Dinaric Alps—well shown in the island-chains of the Adriatic—are continued southwards through Albania, Epirus, the Ionian Islands and the Peloponnese, to reappear in a southern chain of islands bounding the Ægean Sea, Crete being the most conspicuous. Euboea and North-eastern Greece is also occupied by limestone fold-mountains with a trend from west to east. In Bulgaria, the Balkans show a similar direction.

The intervening region, consisting of most of the rest of the Peninsula south of the Danube, with the exception of the western ranges and the Balkans, is a mass of much



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FIG. 123.—CONSTANTINOPLE, LOOKING NORTH-WEST UP THE GOLDEN HORN.

Do you see any mosques or minarets? Does this look like a commercial harbour? Is there any tide here? Why do minarets always have projecting galleries? Give the latitude of Constantinople, and its difference in time from Greenwich. How many towns on the continent have a greater population?



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FIG. 124.—ANCIENT ROME, SEEN THROUGH A TRIUMPHAL ARCH.

The view is taken from near the Capitoline Hill looking south-east across the Forum. In the foreground, under the covers, is the tomb of Romulus, recently excavated. In the distance can be seen the Arch of Titus, the captor of Jerusalem. Notice the Roman method of paving roads, and the classical style of architecture, so often badly copied in modern times.

older crystalline rock, which rises often to a height of nearly 10,000 feet in the Rhodope Mountains, Olympus, and the Shar Dagh. This region is traversed by two remarkable troughs, now utilized by the railways from Servia to Salonica and Constantinople, just as in ancient days they acted as the most important highways into the interior.



FIG. 125.—LAKE LUGANO.

Between Como and Maggiore. The water must be imagined of an intense blue the houses of pink marble. Looking north. What mountains are these? What great railway comes down the valley opposite? The foreground is a typical example of Italian cultivation in terraces. The rows of sticks are to support vines. Why do you think that this view was taken in spring-time?



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FIG. 126.—NAPLES. OLIVE TREES IN THE FOREGROUND.

Why are olives cultivated? Can they stand drought? Locate Naples in the map on plate 32. Give its approximate latitude and longitude. What is the mountain? In which direction is the mountain from the point of view? Account for the peculiar shape of the mountain? Contrast the architecture with that of Constantinople and Moscow (see figs. 107 and 123). Is Naples the most populous town in Italy (see plate 33)?

Climate and Products.

A From the Isothermal Maps on Plate 25 it can be at once seen that in winter the Po Valley has a similar climate to Central France or Eastern England; that is, with enough frost and snow to prevent olive trees from flourishing; that Bulgaria and Rumania share the climate of South-western Russia, and therefore are naturally suited to the growth of wheat and maize—Rumania is, in fact, one of the most important wheat-growing countries of Europe, three-fourths of its exports consisting of grain. All the region south of isotherm 40° (in January) may be regarded as in the Mediterranean zone of climate and vegetation, resembling the Riviera, except of course in elevated districts. Here the olive and vine are conspicuous. Italy is second only to France as a wine-producing country. All the crops of Europe can be produced within her fertile borders; the wheat of Sicily, the wheat, rice and maize of Lombardy, being famous. Most of the currants of commerce come from Greece.

The Rainfall Map on Plate 26 indicates a fair annual average in all this region, but its seasonal distribution is of great importance. Throughout these peninsulas, except in the north, there is a tendency to prolonged drought in summer, and hence much of Italy and Greece shows withered and parched vegetation, except where irrigation has been highly developed, or where mountains induce some rainfall.

B Oranges and lemons are notable products of the irrigated lands of Sicily.

Italian agriculture is much hampered by the prevalence of malaria in the southern half of the kingdom, and fertile lands have often to be left uncultivated for this reason.

The splendid natural resources of European Turkey are only partially developed, owing to the system of government; but even so, there are considerable exports of tobacco, barley, figs and raisins.

C Serbia is another instance of a naturally rich land poorly developed. A very small proportion of the land is cultivated. The rearing of swine upon the acorns of the great oak forests is still the leading industry.

Industries and Trade.

A Outside agriculture there are few industries within this region. Much activity is shown in Northern Italy, but lack of native coal prevents great developments. Silk weaving is important. Genoa is by far the greatest of Italian ports, and acts as the seaport of South-west Germany.

Constantinople still remains the leading trading town of the Nearer East. Smyrna, though outside Europe, belongs in many ways to this region, and must be mentioned as the chief exporting centre of raisins, figs and Turkey carpets.

QUESTIONS AND EXERCISES.

- A** 1. Write a list, with symbols from Plate 33, of the rivers, mountains, lakes, islands, political divisions, and parts of sea which are named in brown, and be ready to write or repeat from the Test Map. Add to what country each island belongs.
2. Name five seaports, marked in brown, two volcanoes, and the straits east and west of the Sea of Marmora.
3. Make a list (from page 59) of the populations of Italy, United Kingdom, Turkey-in-Europe, Rumania, Bulgaria, Serbia and Greece, in order, giving the numbers to the nearest million.
4. Do the same as to their volume of trade by value, giving figures to the nearest five million pounds.
5. In a journey by train from Budapest to the Bosphorus, and from the St. Gotthard to Naples, what towns would a traveller pass?
6. What port in Italy would most naturally be called at by a ship sailing between London and India?
7. Account for the importance of Bucharest, Belgrade, Genoa, Constantinople.

[The city of San Marino is the oldest and smallest republic in the world, with about 8,000 inhabitants.]

- B** 1. Write a list, with symbols from Plate 33, of the rivers, mountains, peaks, lakes, islands, states, and parts of the sea which are named in brown or blue, and be ready to write or repeat from the Test Map.
2. Mention five different routes by which a traveller might cross the Alps by train from Bologna.
3. Write a list, with symbols, of the divisions of Italy, Greece, Turkey, Bulgaria, and Rumania, as marked in blue.
4. Name six divisions which appear to you less mountainous than the rest.

- C** 1. Make a list, with symbols, of all rivers, mountains, peaks, lakes, islands, states (with divisions), and parts of sea. Be ready to repeat these from Test Map. Say to which country the various islands belong.
2. Make a list of the naval stations of Italy.
3. How is Italy an important link with the Far East; the Balkan Peninsula with the Near East?
4. Compare the two peninsulas in respect of population, area, natural boundaries to the north (their extent and kind), geological formation, natural products and trade.
5. Compare the climate and products of Lombardy and Bulgaria, Sicily and Morea.
6. What are the four ports of the Danube basin? Why is it that not one of them is at the mouth of the river?
7. What places would a railway traveller pass on his way from Milan to Brindisi, Budapest to Constantinople, Marseilles to Naples?

Foreign spellings: Genova (Genoa), Milano (Milan), Torino (Turin), Firenze (Florence), Venezia (Venice), Napoli (Naples), Sardegna (Sardinia), Livorno (Leghorn).

ITALY AND BALKAN PENINSULA.



ITALY AND BALKAN PENINSULA.—Test.





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FIG. 127.—ST. PETERSBURG.

[Photochrom Co., Ltd.]

The photograph was taken at about 10 a.m. Is this the south or north bank of the river? What river? Is it navigable for sea-going steamers? Do you notice anything curious about the equipage of Russian carts?

European Russia, Scandinavia, Denmark.

No special maps of these countries are given, as their features and topography can be easily seen from Plates 21, 23, 25, 26, and 27.

Climate, Products and Trade.

A comparison of the Temperature, Rainfall and Vegetation Maps of Europe will make it clear that the zones of climate and vegetation do not follow the lines of latitude, but vary rather from east to west. With the exception of the west of Norway, the south-west of Sweden, and Denmark, almost the entire area has a continental climate.

The rainfall in a similar manner decreases from west to east. The isobars show that except along the coasts most rain must fall in summer, as then only can winds from the ocean penetrate easily inland.

Agriculture is by far the most important industry, as might be expected from the lack of coal, except in Russian Poland and round Moscow and Kharkof.

Mining is of importance in Sweden and the Urals.

Denmark and Southern Sweden may be treated together as a region somewhat similar in climate to Eastern Scotland. Dairy farming is the chief industry. The export of Danish butter to Great Britain amounts to £9,000,000 a year. Oats, rye, and potatoes are the staple crops.

Much of the rest of Sweden and Norway, wherever the elevation is not too great, is tree covered, and the export of timber is of great value.

The manufacture of wood, chiefly by means of water-power, is the leading industry of Scandinavia and Fin-

land. Sweden also has some not unimportant iron and steel works.

The Danes, Scandinavians and Finns are nearly all highly educated and technically advanced, as opposed to the large majority of Russians.

The great forest region extends across the northern half of Russia; this is succeeded by the central belt, where the leading crops are rye and oats, while the hot summers of the South are suited to wheat and maize. Flax and hemp are characteristic crops of Central Russia, and provide valuable materials for export.

QUESTIONS AND EXERCISES.

1. Write a list, with symbols from Plates 21 and 22, of the rivers, mountains, and parts of sea marked in brown, which have connexion with these countries. Be ready to repeat from the Test Map (Plate 22).
2. Do the same for towns, from Plates 23 and 24, arranging them according to their countries.
3. Name the capitals of these four countries, the largest lake in Europe, the chief island of Denmark proper.
4. Make diagrams on squared paper to illustrate the comparative populations and foreign trade of these four countries (see page 59).
5. From Plate 20, write down the chief exports of these countries to the United Kingdom.

B One of the richest iron mines in Europe has now been opened in Swedish Lapland. Northern Sweden is being rapidly developed. The railways of this country, taken as a whole, are more extensive in comparison with the population than those of any other European state.

The egg industry is of great importance in Denmark and Russia. Each of these countries sends about £1,000,000 worth to the United Kingdom annually.



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FIG. 128.—STOCKHOLM.

The picture was taken at about 2 p.m. In what direction did the camera point? The town is built amid islands, where the arms of the Baltic and the lake-system meet. On which side is the Baltic? Do you see any sign of sea-traffic? Was this taken during hot weather? Compare the July temperature of Stockholm with that of London (Plate 25).

QUESTIONS AND EXERCISES.

1. Make a list, with symbols, of the rivers, mountains, parts of sea, and lakes marked in blue or brown, which have any connexion with these countries. Be ready to repeat from Test Maps.
2. Do the same for the towns, arranging them according to their countries.
3. What towns belonging to these countries would you expect to be the chief ports of the Baltic and Black seas?
4. Account for the importance of Copenhagen, Bergen, Warsaw, Odessa, Astrakhan, Archangel.
5. Give the average temperature in January and July of Archangel and North Wales. Account for the differences. Which has the greatest range?

C Besides the fir-forests of the North of Russia, there is marked on the Vegetation Map on Plate 26 a tree-covered region midway between the Black Sea and the Baltic. This corresponds to a region of comparatively light population. Much of this timber is floated down the rivers to the Baltic.

The petroleum industry that centres round Baku is of enormous value, and its only rival in the product of natural mineral oil is the United States of America.

Russian railways are less developed than those of most European states. The navigable rivers are of less use than would be expected, as they are frozen for much of the winter and too low during the summer. Only during the spring floods can full use be made of them.

In Norway the fisheries are of great value, and fish-curing is the almost universal occupation of the inhabitants of the coast. Norway thus produces a numerous race of sailors, who not only man the extensive mercantile marine of their own country, but, together with the Swedes, are to be found very commonly on British ships.

QUESTIONS AND EXERCISES.

1. Make a list, with symbols, of all the towns mentioned in Russia, Sweden, Norway, and Denmark (on Plate 23). Be prepared to repeat them from the Test Map.
2. What are Russia's naval stations? Mention all the ports of the four states in question.
3. Account for the distribution of population in Norway and Sweden. Why is Russian Poland the most densely populated part of the empire?

4. The Donetz coal-field, north of the Sea of Asof, is by far the richest in Russia. What is the port of this region?
5. On what rivers are Kasan, Kief, Riga, Orenburg, Rostof?

REVISION QUESTIONS.

- A**
1. Compare Europe in size with the other continents.
 2. Compare the climate and rainfall of Western Norway and Central Russia.
 3. Name the chief mountain ranges of Europe. Compare them as to height with Ben Nevis and the Himalayas.
 4. Name the states of Europe, with their capitals.
 5. Give the four most populous states of Europe, and the three least populous.
 6. In what way is the arrangement of sea and land in Europe advantageous?
 7. What are the chief European ports in the Mediterranean? Give some account of the nature and direction of their trade.
 8. Give some account of the navigable waterways and canals of Europe.

- B**
1. Compare the configuration, climate, products, industries and state of development of France and Spain.
 2. What are the chief manufacturing centres of Europe? Give some account of them.
 3. Account for the importance of Salonica. What is the "Near Eastern" question?
 4. What states have broken away from Turkey since 1820?
 5. Give the dates for the formation of the modern states of Italy, Germany, Austria-Hungary, Greece, Belgium.
 6. Among what three empires has Poland been divided? Give some account of its climate and products.
 7. How would you divide Russia into Zones of Vegetation? Give physical reasons.

8. Why have Spain, Italy, Norway few manufactures?

- C**
1. What parts of Europe have been affected by Mohammedan conquests at any period? What evidences still remain?
 2. Describe generally the arrangement of isotherms over Europe in January and July.
 3. Explain how the arrangement of isobars (see Plate 25) causes the prevailing winds in Europe at different seasons, and say how the rainfall is thereby affected?
 4. Can you explain the causes of the formation of the Alpine lakes, the lakes of Finland, the fiorded coasts of Norway, Western Scotland, and Dalmatia?
 5. Why does the possession of older sedimentary rocks place England in a more advantageous position than Italy?
 6. Describe in general terms the geological structure of the Alps, and of the Iberian Peninsula.
 7. What are the great continental ports of the North Sea? How are they connected with the interior of Europe?

CONTENTS OF PART IV.

(Fourth Term.)

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(NOTE.—It is recommended to revise Plates 8 and 9 with the questions on page 29, at the beginning of each term.)

Position on the Globe.

A To realise the relative positions of the continents of North America and Eurasia the best method is, no doubt, to study a model of the earth. If a globe is not available, much can be done by using different flat projections.

The map on Plate 6 will show that these great continents encircle the North Polar basin almost symmetrically, while the opening between Greenland and Norway is much wider and deeper than the Bering Strait.

A look at Plate 2 will at once make clear the fact that Asia and North America occupy very similar positions in regard to the great Pacific Ocean. If a map of this sort were folded along meridian 180°, the United States would coincide with China, and Southern Canada with Southern Siberia. See also Plate 8.

Towards the equator, a comparison between the relative positions of Mexico and the West Indies, with the southern extremities of Arabia, India, and the Malay Peninsula, can easily be made from the same map.

QUESTIONS AND EXERCISES.

(Using the above mentioned maps.)

- A** 1. How many degrees nearer to the North Pole is the mainland of Asia than that of North America?
 2. How many degrees nearer to the equator is: (a) Singapore than Panama; (b) Hongkong than Havana; (c) South of Vancouver Island than South of Ireland; (d) Ottawa than Paris; (e) San Francisco than Madrid?

- B** 1. Now many miles nearer the North Pole is: (a) Sakhalin than Newfoundland? (b) St. Petersburg than Winnipeg? (c) San Francisco than Smyrna? (d) Winnipeg than Irkutsk; (e) London than Peking?

2. Make a list of five great towns fairly near to lat. 40° N., three to 50° N., three to the Tropic of Cancer.

C 1. On the Mercator map of the world, does a straight line from London to Peking represent the shortest distance? Explain your answer. (Page 25.) Is the same true (on Plate 34) of a straight line from Ceylon to mouth of the Yenesei?

2. When it is noon at Greenwich, what time is it at Madras, Tokio, Dawson City, and Mexico City?

Size.

The map on page 24 gives the areas of the continents in millions of square miles.

QUESTIONS AND EXERCISES.

- A** 1. Write down in millions of square miles the areas of Asia, North America, Europe, and Eurasia.
 2. How many times the unit of area (page 31) are the above continents respectively?
 3. How many Australias would equal Asia in area?
 4. What fraction of Africa is North America in area?
 5. How many degrees is it (a) from the south of Malay Peninsula to Cape Chelyuskin, (b) from Bering Strait to West Coast of Norway?

- B** 1. What fraction of the combined area of all the continents is (a) Asia, (b) North America?
 2. Is the Pacific Ocean larger than Asia; Hudson Bay than the Black Sea; Iceland than Ceylon; Vancouver Island than Sicily?

3. In what time could a bird fly, at fifty miles an hour, from London to Birmingham, from Singapore to Cape Chelyuskin, from Mexico City to Winnipeg?

- C** 1. Compare the distances from the sea of Winnipeg and Irkutsk (north, south, east, and west).
 2. If the journey from Moscow to Vladivostok takes ten days, what is the approximate rate per hour?
 3. If the average rate of a train from Quebec to Vancouver is thirty-five miles an hour, how long would the journey take?

Surface Characteristics of Asia.

A The map of Asia (Plate 34) shows that if a line is drawn from the south end of the Caspian to Bering Strait, the continent is divided into two distinct parts—one exceedingly level, the other very mountainous.

The great plains of Siberia are very similar to the great European plain in Germany and Russia, and are divided from it by the comparatively low ridges of the Ural uplift. The mountainous half consists of a great series of plateaus, with the exception of the river plains in Mesopotamia, Northern India, Siam, China and Manchuria.

Of the elevated masses, Arabia and Southern India are true tablelands, composed of horizontal layers of rock; all the rest are systems of gigantic folded mountains, Asia Minor and the Iran plateau of Persia being generally over 3,000 feet—Tibet, the loftiest of all, having its valley-floors usually about 12,000 feet above sea-level. There is a large area of comparatively low land with continental drainage in the centre of the great mountain mass, consisting of the Tarim basin and the Desert of Gobi.

The great mountain ranges—in almost every case—are the edges of great plateaus, often rising considerably above the interior level, but in many cases only appearing as mountains at all when viewed from the surrounding plains.

The eastern coasts of the continent are fringed with successive wreaths of volcanic peninsulas or islands from Kamchatka to Sumatra.

B The great fold-mountain system of Asia may be said to start from the plateau of Asia Minor. Here the direction of folds follows the lines of latitude roughly parallel to the coasts. In Armenia the folds seem to approach each other in a kind of node near the source of the Tigris. They then open out, encircling the high land of Persia, and again close up in the lofty Pamir region. From here, extending in two huge sweeps, they enclose the great plateaus of Central Asia, to meet again near the west coast of the sea of Okhotsk. The Himalayas are the most striking feature of the southern system—the Tien Shan, Altai, and Sayan, successively rising from the great plains, form the northern barrier.

Of the area thus enclosed, Tibet is embraced in a similar way between the Himalayas and Kwen-Lun. At its eastern end, where the Salwin, Mekong and Yangtse approach each other, another node is found, from which a series of ranges, much dislocated and faulted, spread southwards towards Burma and Siam.

C The western fold of the latter system seems to extend through Assam, the Andaman and Nicobar Islands to Sumatra. Its middle limb forms the Malay Peninsula, while its eastern edge forms the high ground of Tonking and Annam.

Between the Kwen-Lun and the Altai should be noticed the remarkable depressions that are found between the folds.

It will be noticed that Asia contains the greatest area of inland drainage in the world. The Caspian, Aral, and Balkash are the chief receptacles for this water. They are of course salt, and are perceptibly shrinking in volume.

In fact, the whole of Central Asia is undergoing a period of desiccation, probably owing to a decrease in average rainfall due to unknown causes. The remarkable observations of Dr. Sven Hedin in the Tarim basin have established the truth of such a theory.

Much of the water that falls in Arabia and Persia never reaches the sea, owing to the basin-like character of their formation.

The Deccan of India and the great Arabian peninsula besides being true tablelands, and therefore distinct from the other upland regions of Asia, contain within them rocks whose fossils seem to show a connexion with the ancient flora of Australia, South Africa and South America, and suggest extraordinary changes in land distribution since early geological times.

Arabia is separated from Africa by the remarkable rift valley of the Red Sea, which sends out a branch northwards to form the still more curious depression of the Jordan valley, where the surface of the Dead Sea is 1,300 feet below mean sea-level.

(See map of Palestine near the end of this Part.)

Surface Characteristics of North America.

A From Plate 34 it can be seen that the meridian 100° W. divides the continent of North America roughly into two halves—one mountainous the other comparatively low. The great Rocky Mountain system of the west is by no means of a uniform nature. The Pacific coastal ranges and the Rocky Mountains proper may be generally described as a complicated system of folded mountains, with remains of volcanic energy in certain places. Between these two ranges are to be found a typical tableland of horizontally stratified rock denuded into the famous cañons of Colorado, and farther north an equally remarkable plateau consisting of lava of enormous thickness, pierced by the deep gorges of the Snake River.

Between these two plateaus are the Great Basin ranges, the water from which cannot reach the sea.

Between the Rocky Mountains and the low belt of land along the 90th meridian are to be found the great plains of treeless grass land, fairly elevated above sea-level, but by no means absolutely level.

The eastern half of the continent obviously contains low coastal plains of some width bordering Hudson Bay, the Atlantic, and the Gulf of Mexico, the latter coastal strip being joined by the great flood plain of the Mississippi.

The Appalachian system may be taken to include all the mountains which extend parallel to the Atlantic coast, from the mouth of the St. Lawrence to the plains of the Gulf of Mexico.

Generally speaking, this is a system of upheaved and folded sedimentary rocks, with remains of a previously denuded mountain system frequently appearing through them, in the form often of isolated granite blocks. The later stratified rocks contain the coal measures.

North-east of the great lakes there extends the denuded Laurentian plateau of very ancient sedimentary rocks as far as the coast of Labrador.

The entire surface of the northern half of the continent has been largely modified by the great ice-sheet which in comparatively recent geological times extended as far south as the courses of the Missouri and Ohio, reaching the sea where the cities of New York and Vancouver now are.

North of this line the great plains and prairies are covered with glacial drift, often most fertile. As the huge ice-covering retreated, the surface was left in such a condition that the water could not easily find its way to the sea. Hence the vast systems of lakes, the remnants of still larger areas of imperfect drainage. The ease with which railways are made over the level plains, unobstructed by rock ridges, and the magnificent system of inland navigation are among the direct results of this remarkable era.

B The Rockies in their system of folds reveal almost every kind of rock from Cambrian to Cretaceous, and are a favourite prospecting ground for miners. Gold, silver, and copper, are the most common minerals, but coal—chiefly lignite—also occurs.

The Colorado cañon (see page 8) is the most remarkable instance of vertical denudation in the world. Here and there the even stratification of the rocks is interrupted by intrusive volcanic flows, often of comparatively recent date. Much of this region is almost uninhabited owing to deficient rainfall. Its chief value seems to lie in the remarkable insight that it has given into the process of valley formation.

The Columbia plateau is in reality a system of valleys filled up by a series of lava flows, often 1,500 feet in thickness, through which the Snake River has cut its remarkable cañon. In one part 4,000 feet of rock have thus been exposed, the lower part naturally consisting of rocks beneath the lava flow.

The Sierra Nevada are largely composed of granite: the highest summits of the Cascade group are volcanic.

The Appalachian system consists of a core of much worn ancient rocks, which once, no doubt, were of considerable elevation. These have been covered up by later deposits, and again raised and denuded into their present series of valleys and ridges. The great harbours of the east coast are generally submerged valleys. The Hudson, Potomac, and St. Lawrence owe their width and depth to this latter circumstance. Hence their navigability and the importance of their great cities.

Along the coast of British Columbia the curious interlacing of land and sea is the result of a sinking of the crust; the fiords are submerged valleys, the islands the remains of mountain ridges. The coasts of Norway and Chile present a remarkable similarity, owing, no doubt, to identical causes. The natural tendency of the winds is to bring abundant rain or snow to these coasts, hence the heavy glaciation in the ice age and the great erosion of the valleys. In many cases the glaciers may have worn away the rock floors below sea-level. Fiords are often found to get deeper as they extend inland.

C One of the best known regions in the Rockies is the Yellowstone Park—a vast plateau largely built of lava beds, about the size of Yorkshire, reserved by the Government in a state of nature, as a refuge for wild animals, and a delight for holiday-makers.

It is surrounded by picturesque mountains, and contains famous hot springs and geysers, and the falls and cañon of the Yellowstone River.

It should be noticed that in the Basin ranges there are sometimes very deep depressions—in two instances with their floors below sea-level—one just north of the Gulf of California, cut off from the sea by the delta of the Colorado River; the other almost 200 miles north of this (lat. 36° N., long. 116° W.).

Amid the Pacific ranges the remarkable rift valley of the Yosemite, with walls of granite 3,000 feet high, is a curious and beautiful natural feature.

A western outlier of the Cascade range is the famous extinct volcanic cone of Mount Shasta, with its snow-fields and glaciers.



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FIG. 129.—MOUNT SHASTA.

This lies in about latitude 42° , about 100 miles from the sea. Locate its position in the map. Near the boundary between what two States does it lie? How far is it from San Francisco? It is an extinct volcano, preserving its conical form, though much worn by watercourses and glaciers. It is over 14,000 feet high. How does it compare in height with Ben Nevis and Mont Blanc? Notice the pine trees common along that part of the coast ranges, and the cut logs in a millpond ready to be sawn up into planks for export. For what purpose are the long poles used? A typical "lumbering" scene. Where else in the world is a similar industry important?

Generally speaking, the Rocky Mountain system has few glaciers south of the Canadian border. Alaska abounds with some of the finest examples. Many of these reach the sea, where they terminate in magnificent cliffs of ice.

The great valley of the Sacramento to the east of San Francisco is an instance of a sinking similar to that of the Yosemite. It has been largely filled up again by lava flows and detritus from the surrounding mountains, and now constitutes the great wheat-growing region of the Pacific slope.

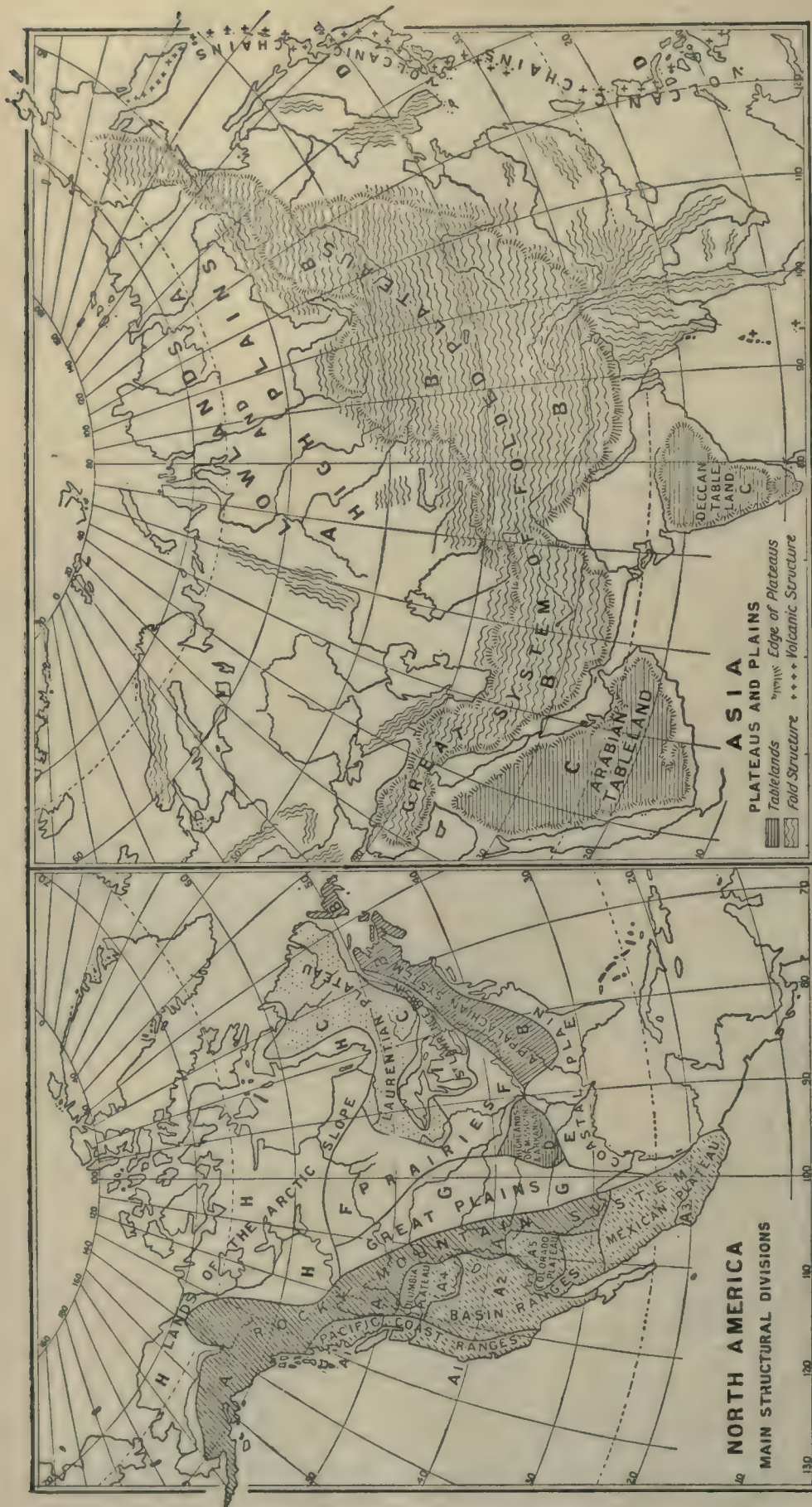


FIG. 130.

Structural Maps.

The very different structures of Asia and North America have prevented the same method of treatment being adopted in the above maps. The core of Asia consists of the greatest mass of high land in the world, whereas the centre of North America is comparatively low. North America has well-defined mountain systems; in Asia the division between various groups and ranges is by no means simple. In the map of the North American continent the natural divisions correspond to the previous description. Of course, such definite lines as are here shown do not accurately represent the actual facts. The change from mountain to plain can seldom be as sudden as these would seem to imply.

In the map of Asia the great system of folded plateaus can be divided into three fairly well defined lobes. Their surfaces are by no means flat.

They are all the result of earth folding, and many ridges and valleys are to be found within them. The closer shading shows where the edges of the elevated region are particularly abrupt. It will be noticed that many branch systems of fold-mountains surround the great central plateaus. As would be expected, the earth's surface has been more intensely crumpled against the walls of the central mass.

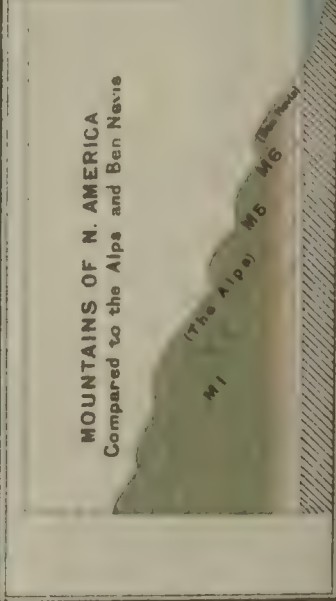
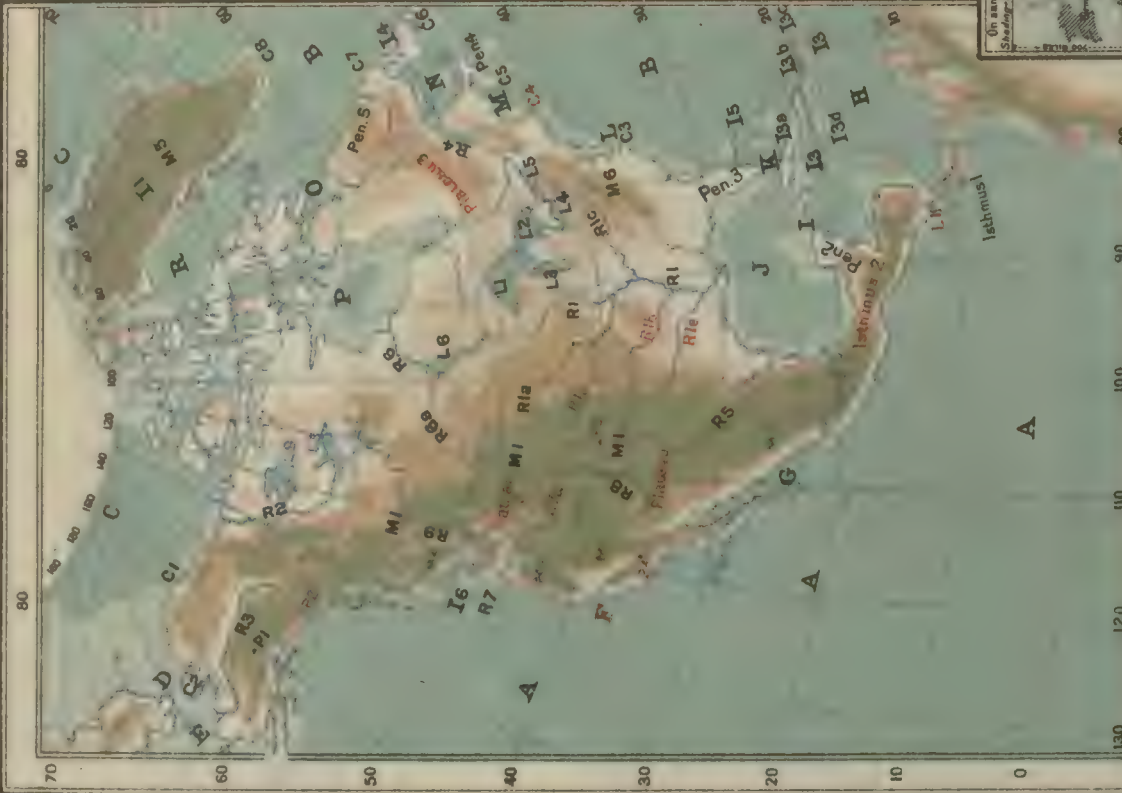
The four natural divisions are indicated by the letters (A) Lowlands and High Plains, (B) Central Folded Plateaus, (C) Tablelands of Arabia and the Deccan, (D) The Volcanic Chains.

QUESTIONS AND EXERCISES.

1. Make a tracing of this map of North America, marking in the coast line and natural divisions. Place this over the map on the next page, put the symbols instead of the names, and bring up for use as a test map.
2. Do the same for Asia.

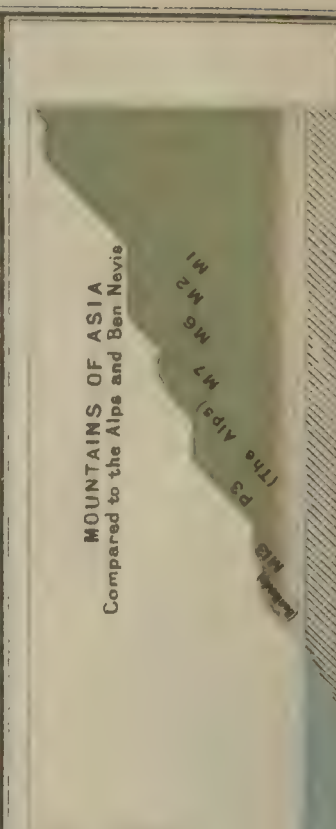
NORTH AMERICA & ASIA.—Physical.





MOUNTAINS OF N. AMERICA
Compared to the Alps and Ben Nevis

| Mountain | Height (feet) | Length (miles) | Area (square miles) |
|--------------|---------------|----------------|---------------------|
| M1, M2, etc. | | | |
| R1, R2 | | | |
| P1, P2 | | | |
| Plateau | | | |
| A, B, C | | | |
| Pen. 1, 2, 3 | | | |
| I1, I2, I3 | | | |
| C1, C2, C3 | | | |
| L1, L2 | | | |



MOUNTAINS OF ASIA
Compared to the Alps and Ben Nevis

| Mountain | Height (feet) | Length (miles) | Area (square miles) |
|--------------|---------------|----------------|---------------------|
| M1, M2, etc. | | | |
| R1, R2 | | | |
| P1, P2 | | | |
| Plateau | | | |
| A, B, C | | | |
| Pen. 1, 2, 3 | | | |
| I1, I2, I3 | | | |
| C1, C2, C3 | | | |
| L1, L2 | | | |

B The lowlands and high plains of Siberia in some ways resemble the prairies and great plains of America. The former are often suited for the growth of wheat, the latter, owing to their elevation or lack of rainfall, are often suited only for pasture.

QUESTIONS AND EXERCISES.

1. Railways in North America are far more highly developed than in Asia. How far is this due to natural structure?
2. In North America the shaded portion represents mountains, the white part, plains. Write a list of the chief mountain systems and plains, with symbols, according to their proper groups.

C In both continents, as would be expected, volcanic activity is most apparent along the Pacific coasts; i.e., where great oceanic depths approach near to high mountains. Wherever there is a comparatively low coast, or a noticeable continental shelf, the signs of volcanic energy are naturally absent. It is easy to imagine how the great series of folds which caused the elevation of Kamchatka, Japan, Sumatra, and Java, have caused fractures along their oceanic border, that sea water has found its way in, and that the steam thus generated has resulted in the violent upheavals so common in those regions, a large proportion of whose surface now consists of ejected materials. Similar phenomena are to be found along the Pacific coasts of America, especially in Mexico and the Western States.

The highlands of Missouri and Arkansas, though of no great elevation, are in marked contrast to their surroundings. They consist of a series of gently tilted strata, worn into very well-defined escarpments, often recalling the scenery of the Alleghanies. Geologists now recognize that both owe their origin to somewhat similar causes. Much of this area is well wooded, in contrast to the treeless prairies to the north.

QUESTIONS AND EXERCISES.

1. Account for the shape of Nova Scotia and Southern California. Is the Bay of Fundy caused in the same way as the Gulf of California?
2. Contrast the physical structure of the islands of Asia with those of North America?
3. Discuss the causes of the distribution of volcanic energy in North America and Asia.

QUESTIONS AND EXERCISES ON PHYSICAL MAPS.

- A**
1. Write a list, with symbols, of the mountains, peaks, rivers, lakes, parts of sea, islands, peninsulas, and capes which are marked in brown in North America. Be ready to repeat from Test Map.
 2. Do the same for Asia.
 3. Name the chief plains of North America. Describe the surface of Greenland.

4. The lakes of North America are fresh except one. Which is this? The inland waters of Asia are salt except one. Which is this? Explain the reasons.

5. Name (where possible) the extreme points of the mainland of North America and Asia, towards the north, south, east, and west.

6. What contour-line goes through the great plains of North America? Between what contours are the prairies? Most of the basin of the Obi is below what contour-line?

7. Say whether the greater part of each of these seas is deeper or shallower than 600 feet (or 100 fathoms): Sea of Japan, Yellow Sea, Red Sea, Persian Gulf, Hudson Bay, Bering Sea, Gulf of California, Gulf of Mexico.

8. From the two continents name three rivers with deltas, three with wide estuaries. Name the three longest rivers in each continent.

9. Name two rivers in each continent which look easily navigable, two in each which seem too rapid for this purpose.

10. Between what ranges does the Upper Indus flow? Into what sea does the water from Lake Baikal eventually go?

11. Compare Florida with the Korean peninsula as to size, latitude, surface. By what seas are they bounded?

12. Could the British Isles be contained in the Gulf of Mexico? Are Ireland, Ceylon, and Lake Superior roughly the same size?

13. Using the Test Map only, explain the meaning of the colouring. Write down the names in order of height of the mountains of Asia and North America, given in the diagram below the map. Give the height in each case to nearest thousand feet.

14. How much higher is Everest than Ben Nevis; Mount McKinley (the highest point in North America) than the Alps?

B

1. Write a list, with symbols, of the mountains, peaks, rivers, lakes, parts of sea, islands, peninsulas, and capes marked in brown or blue, in the maps of North America. Be ready to repeat from the Test Map.

2. Do the same for Asia.

3. Mention two rivers with inland drainage, four lakes which are emptied into the Arctic, an Asiatic desert, a volcano in North America, six Asiatic gulfs marked in blue, six seas north of lat. 60°.

4. Trace the coast line, inland waters and rivers of Asia. Shade in pencil the area of inland drainage. (Most of the Iran and Arabian peninsula can be so treated.)

5. Which islands of the coasts of these continents are divided by deep seas, which by shallow seas, from the mainland?

6. In a voyage from the Bering Strait to the Red Sea, along the coast, what seas, capes, and river mouths would a ship pass in order?

7. Do the same for a voyage right round North America, starting from the west side of the Isthmus of Panama.

C

1. Write a list, with symbols, of all the mountains, rivers, lakes, parts of sea, islands, peninsulas, and capes mentioned in the maps of North America. Be ready to repeat from Test Map.

2. Do the same for Asia.

3. Describe any peculiarities in the structure of the Columbia plateau, Colorado plateau, the Arabian peninsula, Kamchatka, Sumatra, and the Red Sea.

4. Name any areas in either continent which are below sea-level.

5. Compare Asia and North America as to facilities for inland navigation and transport.

6. Why are China and Canada comparatively free from earthquakes and volcanic action, as opposed to Japan and Central America?

Ocean Currents, Temperature, Pressure, Winds, and Rainfall.

A A study of the Isothermal Maps on Plate 36 (see Plates 3, 4 and 5, as well) shows the natural resemblance between the conditions in North America and Eurasia. The coasts have comparatively little variation between winter and summer, while the inland regions are hot in summer and intensely cold in winter. In Asia the effects are naturally magnified by its much larger extent.

In both cases an area of high pressure is found in winter, which tends to force the winds outwards; whereas in summer the low pressure in the interior allows rain-bearing winds to enter freely from the oceans. Where the greatest land mass is met by the greatest ocean, it is natural that this tendency should be increased. Hence the marked monsoons of India and South-eastern Asia.

The prevailing south-westerly winds of the North Pacific and North Atlantic bring copious rainfall to the western coasts of North America and Europe, north of lat. 40° , and cause a perpetual flow of warm surface-water to these same shores.

In like manner, the air and ocean-currents circling round the low-pressure areas off the eastern coasts of Kamchatka and Greenland bring floating ice and snow and cold storms down along the coasts of Labrador and of Eastern Asia.

The warm condition of the sea off Vancouver Island and the south of England in winter, the frozen mouth of the St. Lawrence, and ice-bound coast off the mouth of the Amur, show clearly how these similar forces work along the same lines of latitude.

South of lat. 40° , the north-east trades bring rainfall to the West Indies, the Southern States and Mexico, but pass over Southern California as downward currents bereft of moisture.

In Asia their influence is subservient to the monsoons. In winter-time they are able to affect parts of the Malay peninsula and the eastern coasts of Southern India and Ceylon; but during the rest of the year the strong in-draught of the monsoons towards Central Asia entirely overcomes them, and causes a rainy season from April to November throughout South-eastern Asia.

The great desert tract of Central Asia, Arabia, and

Northern Africa can only be matched in North America by the much smaller deserts in the South-western States, but the same causes are at work in both areas: mountain barriers or great land masses prevent rain-bearing winds from the sea from reaching those inland regions.

QUESTIONS AND EXERCISES ON ISOTHERMAL MAPS.

A 1. In January, what is the difference between the coldest and hottest isotherm (1) in North America, (2) in Asia? Account for the greater range in Asia.

2. Do the same for July. Why does isotherm 50° come so far south between Labrador and Greenland? (See map of Ocean Currents, Part I, Plate 4.)

3. What isotherms in January and July pass through England, Vancouver Island, the lakes of the St. Lawrence, the south end of the Caspian, Strait of Bab-el-Mandeb, the north of Sumatra, the south of Sakhalin, the delta of the Lena, the extreme north of Europe?

4. If you allow 1 degree for every 300 feet, what would be the average January and July temperature on the summit of Mount Everest?

5. Would you expect the St. Lawrence, Hwangho, Amur, Volga, and Danube to be impeded by ice in winter? What seas in North America and Asia are likewise cut off from navigation?

6. What isotherms are cut by lat. 40° N. in these two continents in January and July, in order from west to east?

B 1. In July, why is Ceylon cooler than the mouth of the Euphrates, Corea than Cyprus, Newfoundland than Klondike?

2. In July, what causes the irregular bend in isotherm 70° in long. 105° E., in isotherm 55° in long. 130° W., in the isotherms between Japan and the mainland?

3. Why has Asia a greater area of heat in July, and a greater area of cold in January, than North America?

4. Compare or contrast the range of temperature in England with the range at Lake Baikal, Vancouver Island, Ceylon, and the point where the Arctic circle cuts long. 130° E.

5. Why is the west of the Indian peninsula cooler than the east in summer?

6. Compare the temperature of the coast of Labrador with that of Western Norway in winter and summer, and account for the difference.

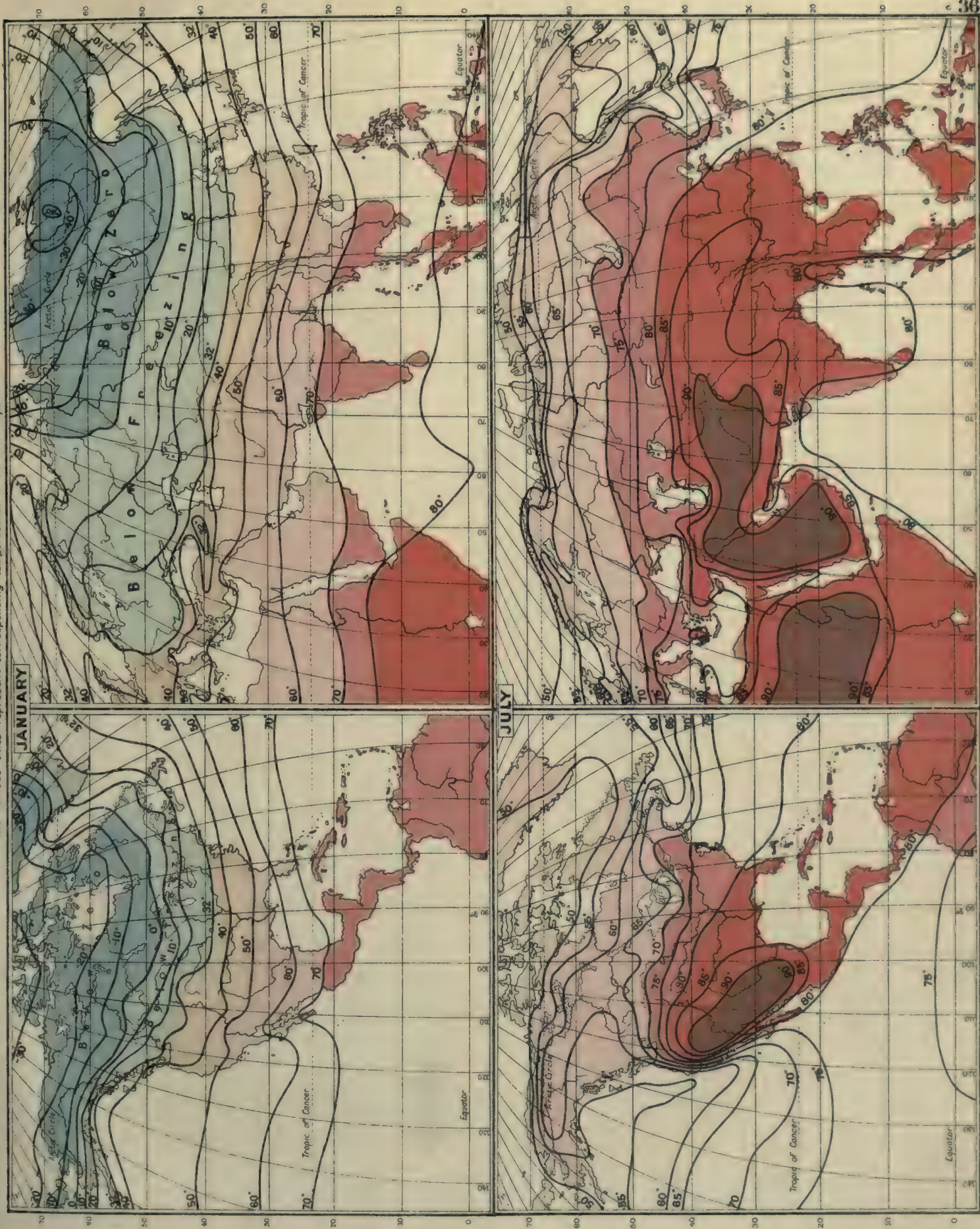
C 1. Account for the small intervals between the isotherms in the west of North America in July, for the wide intervals in South-eastern Asia at the same period.

2. Why is the North Pole warmer than parts of Northern Asia in January, the Caspian warmer in July than parts of the Pacific within the tropics?

3. Judging from the isotherms (Plate 36), why does the high-pressure area in January (Plate 37) lie north-east of the centre of the continent of Asia, and the low-pressure area in July lie to the south-west?

NORTH AMERICA & ASIA.—Isotherms.

The various tints represent corresponding temperatures in all four maps.



Vegetation.

A Temperature and rainfall are the determining causes of the distribution of plant life, and wherever extreme cold and dryness are absent the land is sure to be covered with luxuriant growth.

Owing to the lesser degree of evaporation in countries of fairly high latitude, less annual rainfall is needed for the support of vegetation; hence the wide belt of firs and pines that extends across Canada, Northern Europe and Siberia. South of this belt in the interior there naturally are to be found open grass-lands, as in the great plains and prairies of North America, or in Southern Siberia. Here the long summer days and rains of mid-summer fulfil the conditions necessary for successful wheat-farming. Where the rainfall is not so reliable there have naturally grown up the great cattle ranches of Canada and the States.

The huge forests of the Pacific slope of North America no doubt found their counterpart in England, France, and Western Europe, before the arrival of axe-wielding men. Even now the hilly districts of these countries are often to be found covered with a natural growth of forest-trees. The timber trade of the Baltic is reproduced in the "lumbering" of the St. Lawrence and of the Pacific coast.

Farther south, the mahogany of Central America corresponds to the teak of Burma and the Western Ghats; the rice and cotton of the Southern States to like crops in the great valleys of India and China; the cigars of Havana to those of Manila; while the sugar and coffee of the West Indies reappear as the staple productions of the Malay Archipelago.



From Stereograph Copyright [Underwood & Underwood, London and New York.]

FIG. 131.—RICE FIELD IN THE PHILIPPINES.

Near Manila. Give the latitude. Rice requires plenty of heat and moisture. Here is an artificially irrigated field being ploughed by a native with a buffalo. Scenes like this are common in Burma and the deltas of India, where this would be called a "Paddy Field." Notice the raised house.



From Stereograph Copyright [

Underwood & Underwood, London and New York.]

FIG. 132.—TOBACCO PLANTATION IN CUBA.

Near Havana. Give latitude. The leaves are being cut and carried off to be dried. Sun-dried leaves are usually more valuable than those dried artificially under cover. Of what race are the workers? What kind of trees are there in the right foreground?

B The extreme cold of Northern Asia of course prevents any useful vegetation. Here the ground never thaws more than a few feet downwards. Below is the frozen soil and ice that have preserved so perfectly for thousands of years the remains of the prehistoric mammoth. The great rivers, thawing in their southern courses long before the ice breaks near their mouths, turn the country in summer-time into an impassable swamp. In the terrible north-east portion of the continent travel is possible only in winter-time along the frozen river beds, or the ill-marked tracks that lead to desolate convict settlements, where the average January temperature is more than fifty degrees below zero. In North America somewhat similar conditions produce the barren lands of Northern Canada. The Mackenzie River in spring-time has to struggle for many weeks, like the Obi, to win its way to the ocean, and the gold seekers of the Klondike have to face nearly as great cold as the criminals and political exiles of North-eastern Siberia.

Many parts of the highlands of Asia Minor, Persia, and the Deccan are admirably suited to the growth of wheat, and offer a striking parallel to the wheat area of Central Spain. Only railways are necessary to make Persian and Turkish grain take an important place in the world's market.

C A clear instance of the influence of surface on rainfall is found in the Thar desert of N.W. India, over whose low area the moisture-laden monsoons pass without dropping their precious burden.

Seasonal Variations in Isobars, Winds and Rainfall.

A A careful study of the maps will reveal the general resemblance between these two continents in climatic variations.

In winter-time the pressure gets high over the centres of the continents, as shown by the heavier black isobars; in summer the lighter isobars mark the opposite tendency.

As a rule, therefore, the red arrows which indicate the prevailing winds point from land to sea in the winter, and accordingly the rainfall is slight, as shown by the larger areas of brown at that season.

In summer-time the change of pressure conditions reverses the tendency of the winds, and increases the rainy area in both continents.

Unexpected areas of dryness, or of heavy rainfall, can usually be explained by the surface features.

For the general climatic causes at work throughout the world, reference should be made to Part I, pages 15 to 20.

QUESTIONS AND EXERCISES.

1. How are differences in pressure indicated on these maps? What fraction of an inch is there between each pair of isobars? Name the highest and lowest isobar marked in Asia at either season, and account for its position.
2. How is rainfall indicated? For what periods is it shown in the two pairs of maps? Compare the rainfall of Borneo and Arabia in winter and summer.
3. How are prevailing winds over the oceans indicated? Why do they point away from the heavy black lines as a rule?
4. What is meant by monsoons? Explain what causes them. What is their effect upon the rainfall of India at various seasons?
5. Account for the rainfall of Ceylon in winter and summer. Why does the north of the island get less in winter than the south? (See Physical Map.)
6. Why is the north-west of Japan wetter in winter than the south-east? What part of Japan receives most rain in summer; and why?
7. Account for the difference in rainfall between the Californian Peninsula and Florida.
8. Trace two outlines of the North American map from Plate 37. Mark in all the Isobars with lines of equal thickness, in one map giving the January Isobars, in the other the July Isobars. Then shade or tint in the whole, so as to get an effect similar to the lower two maps on Plate 25, e.g., leave the area below 29.8 white; shade in pencil the area between 29.8 and 30; put diagonal ink lines over the area between 30 and 30.2; put solid ink on the area above 30.2. Add the wind arrows at the end.
9. Do the same for the Asiatic Map on Plate 37.

B It will be noticed that the south-eastern part of the United States receives more rainfall during the winter than would be expected. To account for this, the following reasons may be advanced. The Mississippi valley is low and comparatively warmer than its surroundings. Therefore there is a natural tendency for winds to be drawn up it from the Gulf of Mexico. The north-east trade winds there circle round northwards and eddy back into the influence of the westerly winds of the North Atlantic. That portion of America is within the winter storm area, and hence great variations from the average conditions are common. North-eastern China is somewhat similarly affected.

In the summer-time the rainy area of eastern North America extends right up to Hudson Bay, and Eastern Canada and Newfoundland receive more rain than in winter. Thus the resemblance to the conditions in Eastern Asia, north of Corea, is kept up.

QUESTIONS AND EXERCISES.

1. If the Gulf of Mexico and the Caribbean Sea were dry land, what would be the result upon the rainfall of the Mississippi valley?
2. What part of India receives fairly abundant rain in winter, and why?
3. Compare the rainfall of Newfoundland and Sakhalin in winter and summer. Account for the greater dryness of the latter in winter-time.
4. Account for the rainy area to the east of the Black Sea.
5. Is it true to say that most regions within 10 degrees of the equator receive ample rainfall? Mention any exceptions, and, if possible, account for them.
6. Does the southern edge of the great plateau of Asia correspond with the change from wet to dry conditions in summer? Is this easy to account for if true?
7. What is the effect of the monsoons on ocean currents? (See p. 18.)
8. Make a tracing of the outlines of North America and Asia from Plate 37. Then sketch in from Plate 5 the areas which have a mean annual rainfall of over 80 inches. Cover these with solid ink shading. In the same way show by pencil shading the areas which have a mean annual average of less than 10 inches.

C Throughout the Equatorial regions much of the rainfall is caused by the fact that air is drawn upwards by great heat, and gets cooled as it reaches the upper regions. These are called convectional rains. Marked exceptions to this can be found on the Equatorial east coast of Africa at all seasons, and at the north of South America in winter. It is not easy fully to account for either of these phenomena (see Part V, page 103).

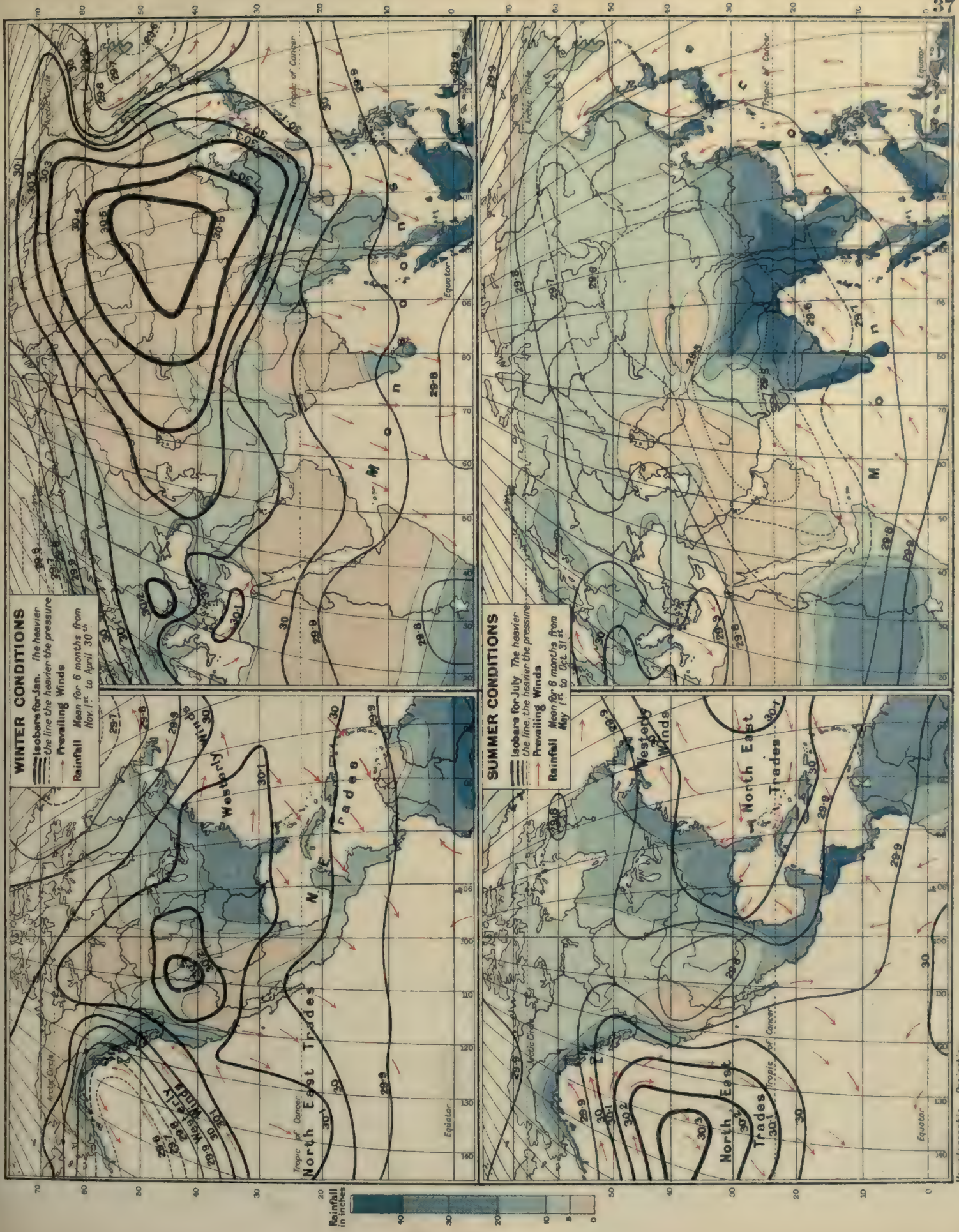
It will be noticed that the Equatorial rainy belt moves N. or S. with the sun, and that, therefore, in summer-time all the regions round Central America receive greater rainfall. Even the south end of the Peninsula of California is affected.

It should be added that the data for these maps are at present insufficient to secure accuracy throughout. Only an approximation to the truth is possible in many regions of the world.

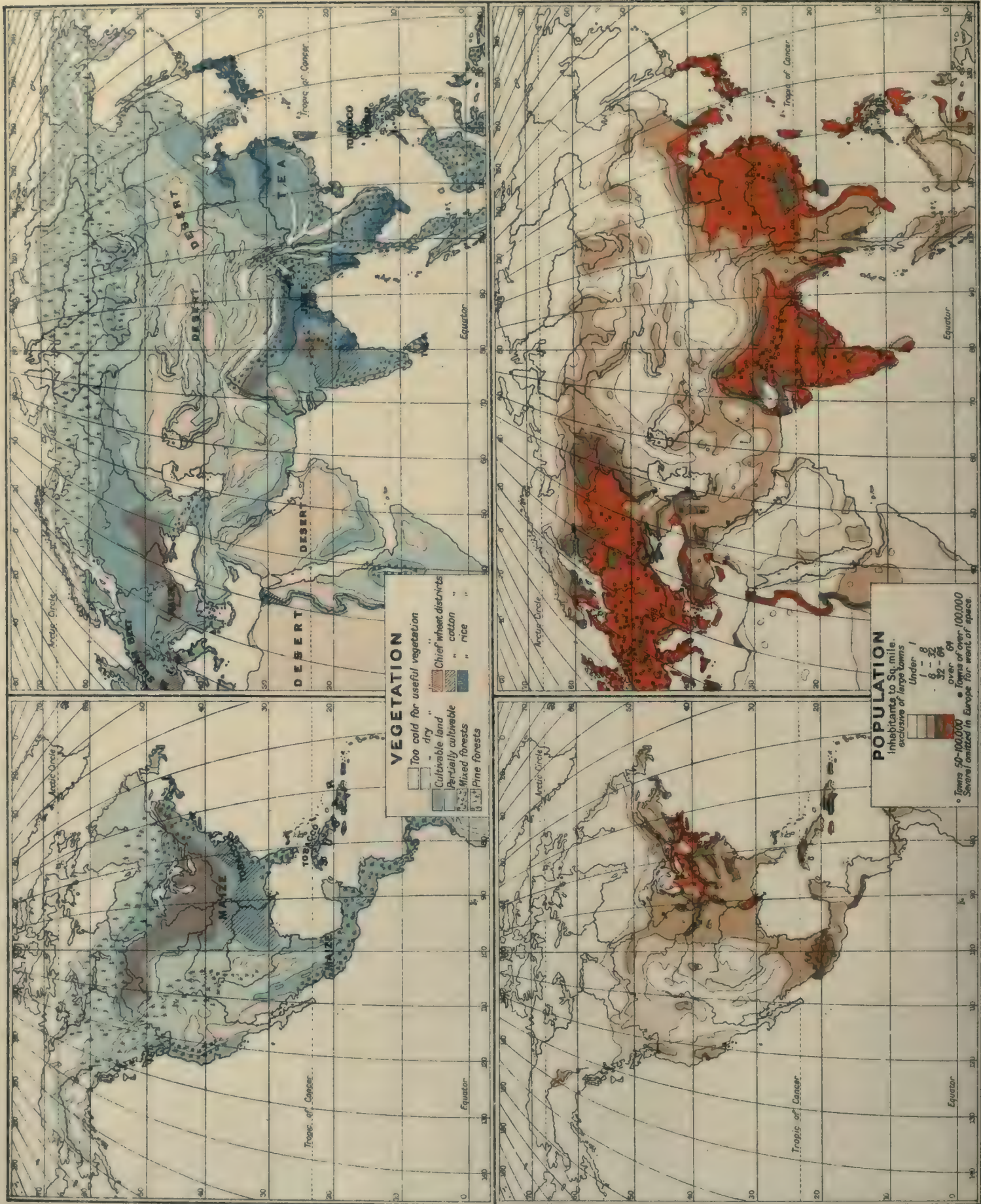
QUESTIONS AND EXERCISES.

1. What is meant by convectional rains?
2. Account for the extreme dryness of the Tarim basin, the extreme rainfall of Sumatra, the want of rain along the lower Indus, the general dryness of the coasts of the Arctic Ocean.
3. In the Pacific Ocean off the east coast of North America the winds circle round an eddy, clockwise, in summer. In winter they move in the opposite manner. Is this normal? (See Part I, pages 16 and 18.)
4. How do cold or warm ocean currents affect the rainfall of their adjoining coasts? Illustrate from these maps. (See Plates 4 and 5.)
5. Would you expect the Tarim to freeze in winter? Dr. Sven Hedin on one occasion crossed the great desert to the south of the Tarim, accompanied by camels, laden with ice instead of water. Explain how this is possible in the same latitude as that of Naples.
6. Make a tracing of the outlines of North America and Asia from Plate 37. Then make them into annual rainfall maps, on the same principle as is used on Plate 5. (Copy the isohyets, etc.)

NORTH AMERICA & ASIA.—Isobars, Winds & Rainfall.



NORTH AMERICA & ASIA.—Vegetation & Population.



Vegetation, Population and Development.

A The Maps on Plate 38 show how very unevenly the inhabitants of Asia and North America are distributed. How far is this due to natural causes?

In Asia, India, China proper and Japan stand out as being fully peopled. These are the monsoon countries, where rain falls at the warm time of year, and so makes agriculture easy, and crops heavy. The winters are comparatively cool and dry, and give the inhabitants a period for rest and recuperation. Thus it is that these countries are thickly peopled with an agricultural population, whose wants are generally few and easily satisfied.

In North America the population is far thicker in the south-eastern part than elsewhere. Here too, most of the rain comes during the summer season, owing to similar causes. The ease of producing foodstuffs is not, however, the only, or even the chief, factor in the distribution of population in the North American continent.

The fact that the eastern coast looks out towards the comparatively narrow Atlantic, is no doubt the reason why European settlers first made that shore their home. The process at first was by no means fast. About a hundred years after Columbus, the first permanent settlement appeared. A hundred years later the interior of the continent began to be opened up. Only in the last fifty years has really fast progress been made. The direction of natural waterways, the building of railways, and the discovery and exploitation of coal and oil and precious metals, have influenced the course of development even more than natural fertility.

The foregoing conditions are of course the chief determining factors upon the kind of life led by the inhabitants. While temperature and rainfall set limits to natural food supplies, both animal and vegetable, the arrangement of mountain and plain is largely responsible for the distribution of population, and often, too, for national boundaries. Again, in discussing the causes of a country's development, the importance of mineral regions and of the character and history of the inhabitants must not be lost sight of.

If Asia and North America are looked at generally, it may be said that the former has had a long history, the latter a short one. The Asiatics have developed most highly where the conditions necessary for the growth of vegetable food have been favourable, as in India and China; in America the distribution of coal and iron and gold has proved an even greater stimulus to a speedy growth.

It would be hard to find greater contrasts than are to be seen in the prevailing characteristics of the inhabitants of these great continents. The placid Oriental, often highly cultured and with great artistic development, stands opposed to the restless, money-making type that is so common in the States.

The results of these different temperaments can be strikingly seen by comparing a railway map of the Eastern States with a similar map of China, or the Broadway, New York, with a street in Peking. The great centres of population in Asia are to be found in the monsoon countries, in the Ganges valley, and the plains of China; in North America the districts round the great seaports or the coal and oil fields of Pennsylvania will be seen to



FIG. 133.—RAILWAYS BETWEEN CHICAGO AND NEW YORK.

be most thickly peopled. A Hindu labourer can support life for a month on the same amount of money that a New York artisan frequently expends on a single meal.

QUESTIONS AND EXERCISES.

A 1. What are the chief wheat-producing regions of North America and Asia? What conditions are necessary for its successful growth?

2. Where are the chief cotton-producing regions in Asia, Africa (as far as shown), and North America? Explain the natural conditions necessary for its growth.

3. Answer the same question as to rice.

4. In what countries are large supplies of sugar, tobacco, tea and maize produced? Explain how natural conditions determine the localities.

5. What are the leading vegetable products of the monsoon countries? Why are they so thickly populated?

6. Does the fertile area on these maps correspond closely with the highly populated regions? Notice any exceptions, and account for them.

7. Account for the distribution of the various tree-covered areas in these maps. How do the trees of Northern Asia differ from the forests of Borneo?

B 1. Pick out the part of Canada where population has not yet filled a rich cultivable area. What causes have hindered its peopling?

2. How do you account for the comparatively rich vegetation and high population along the rivers which run into the Sea of Aral?

3. Why are India and China divided by a belt of comparatively thinly peopled country?

4. Mention any parts where the excessive growth of tropical forest prevents a high population.

5. Account for the various regions of vegetation along the west coast of North America, from Alaska to Panama.

6. Population is gradually creeping westwards over Canada, eastwards over Siberia. Are similar causes at work?

7. What are the most desolate regions of Asia and North America? Account for these from the preceding maps.

8. How many towns of over 100,000 inhabitants are there (a) in North America, (b) in India?

C 1. Compare the Trans-Siberian Railway with the Canadian Pacific as regards the kind of country which it traverses, its political and commercial value, and the results hitherto achieved.

2. In Corea, population and vegetation are obviously dependent upon each other. How are these controlled by the configuration of the surface, by temperature, and rainfall?

3. Compare the Rainfall maps with the Vegetation maps, and find instances where vegetation flourishes in spite of want of rain. How can it?

4. Over most of India vegetation dries up during the winter. Why is this? In what parts would you expect greenness all the year round? (See Rainfall maps.)

5. From Ceylon supplies of tea come at all seasons, as opposed to the seasonal production of China and Assam. Account for this. (More than nine-tenths of the tea consumed in the United Kingdom comes from the Indian Empire and Ceylon.)

6. Jute is a tough fibre plant used for making sacks, ropes, carpets, etc. Name an important district for its growth, and a town in Great Britain where it is largely manufactured. (See page 43.)



From Stereograph Copyright]

FIG. 134.—STREET IN NEW YORK.

[Underwood & Underwood, London and New York.]

Notice the high buildings, made necessary by the great value of land, owing to the fact that New York is built practically on an island. Compare this with the type of building in Peking, which is situated on a great plain with plenty of room for expansion.

Races and Religions of Asia.

A The dominant races and religions of the world have either had their origin in the great Asiatic continent or have there first become important.

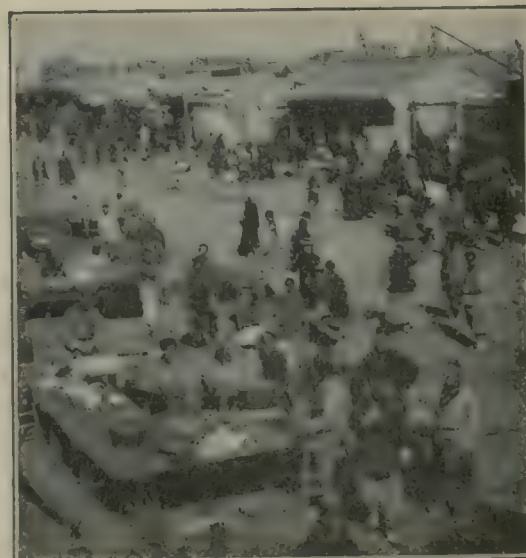
The Caucasian, or White race, though originating probably in Northern Africa, spread in early times over much of Western Asia, and formed some of the most famous civilised nations of antiquity. It has now spread over most of Europe, North and South America, and Australasia, and is by far the most numerous as well as the most powerful of the great divisions of mankind.

The Mongolian, or Yellow race, apparently starting from the highlands of Central Asia, has spread over the eastern half of that continent. The Chinese Empire, Burma, Siam and the Japanese Empire are all chiefly peopled by this race.

The Malayan, or Brown race, flourishes in many of the island regions of the Pacific.

All the great religions, which have a belief in one God, have taken their origin in Asia, and in every case have been identified with various branches of the great Caucasian race. Thus, from Judaea, Christianity has spread over the whole of Europe and America. From Arabia, Mohammedanism has forced its way over Northern Africa and the south-western quarter of Asia. From India, Buddhism has expanded over almost the entire south-eastern portion of the continent, and, though originally springing from a Caucasian origin, now has most of its

adherents among the Mongolian peoples. More individuals profess Buddhism than any other religion in the world.



From Stereograph Copyright]

[Underwood & Underwood, London and New York.]

FIG. 135.—STREET IN PEKING.

Notice the Chinese type of roof, the absence of wheeled traffic (except wheel barrows), the primitive open-air market, the general want of hurry.



From Stereograph Copyright

[Underwood & Underwood, London and New York.]

FIG. 136.—A STREET IN TOKIO.

Locate the town in the map, and give its latitude. What is its out-port? Compare this with the street scenes in Peking and New York on page 82. Notice the physical characteristics of the Japanese, who are short but strong. (The average height of Japanese infantry is just over 5 ft.). This is a very common method of carrying weights in China and Japan. Notice the style of architecture, suited to resist rain, sun, and earthquake. The telegraph wire indicates the spread of modern inventions over the east. Notice the ideographic method of naming the shops.

B The Caucasian race may be conveniently divided into three parts. (1) The Aryan, or Indo-European branch, which embraces the Kelts, Romans, Greeks, Teutons, Slavs and Hindus. All the great European nations are thus derived. (2) The Semitic branch, which includes the Jews, Arabs, and many of the peoples of Northern Africa. (3) The Hamitic branch, of which the Egyptians are the only famous nation.

As to the spread of the great religions of Asia, it may be said that Christianity took five centuries to spread over Europe; that Mohammedanism quickly forced its way by conquest over Northern Africa and into Spain in one direction, through Asia Minor and on to the Danube valley in another, and as far as the valley of the Indus toward the East. Though beaten back from Spain and Hungary, it has retained its power elsewhere.

C Buddhism arose in India about 550 B.C., in antagonism to the ancient religion of Brahmanism. Though it has influenced the older creed, it has never become established as the leading religion of India, two-thirds of whose inhabitants can be classed as adherents of various corrupted forms of Brahmanistic beliefs. In Burma it embraces nine-tenths of the inhabitants. In China the lower classes, in so far as they have any religion at all apart from ancestor worship, may be looked upon as chiefly Buddhists, while the upper and official classes are largely followers of Confucius, whose high moral teaching was contemporaneous with the origin of Buddhism in India.

Japan is covered with Buddhist temples, and can be classed very generally as a Buddhist nation, though all religions are tolerated.

Geographical Dates.

| A | B | C |
|--|--|---|
| 1400 B.C.—330 B.C.
Jewish, Phoenician,
Assyrian, and Per-
sian civilisations
predominant in
Western Asia. | 650 B.C. onwards.
Chinese and
Japanese civilisa-
tions in the East. | 557 B.C. Birth of
Confucius. |
| 300 B.C. Conquests
of Alexander, in-
troduction of
Greek influence. | | 60 A.D. onwards.
Christianity
spreads to Asia
Minor. |
| | | 604 A.D. Rise of
Mohammedanism. |
| | 1497. Discovery of
sea route to India. | |
| 1500 A.D. onwards.
Dutch, Portu-
guese, British,
and French in
Southern Asia. | | |
| | 1550 A.D. onwards.
Gradual spread of
Russia over Si-
beria. | |
| 1757. Battle of
Plassey. British
power estab-
lished in India. | | 1842. First treaty
ports opened in
China. |
| | | 1868. Opening of
Japan to foreign
commerce. |
| | | 1905. Russo-Jap-
anese War ended. |

A China proper and Japan are dealt with later, and so there are few details about these countries on Plate 39. The Indian Empire is more fully treated in Part VI.

QUESTIONS AND EXERCISES.

1. Write a list, with symbols, of the chief political divisions of Asia (marked in brown), grouping the British, Dutch, French, and Russian possessions separately. Mention the chief town in each, where given. Do the same for the divisions of the Chinese Empire. Be ready to repeat from Test Map.
2. Write a list, with symbols, of the towns marked in brown. Be ready to repeat from Test Map.
3. From what parts do railways go to Tashkent, Vladivostok, and Hankau?
4. On or near what rivers are Karachi, Shanghai, and Rangoon?
5. Give a list, with symbols, of the chief ports of Asia, adding in what countries they are, in each case. Be ready to repeat from Test Map.
6. What countries of Asia are wholly or partially within the tropics? What islands are cut by the equator?



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[Underwood & Underwood, London and New York.

FIG. 137.—A CHINESE MANDARIN.

The view was taken in the garden belonging to the official. His wife, daughter and man-servant are visible. Notice the bamboo fence, and the garments worn by men and women. Silk, padded with cotton-wool, is used instead of wool for warmth. Notice the type of countenance,—wide nostrils, narrow eyes, high cheek bones, and square appearance of the face. Felt shoes with thick felt soles are worn, as is usual in China. Notice the long nails, considered a sign of high position, as no manual labour can be then done. Special nail-cases are sometimes worn to protect fine specimens. The typical Chinaman is genial, honest, business-like, and fond of home. All these qualities seem to belong to the subject of the picture.

1. Make a list, with symbols, of all the political divisions here mentioned, grouping them according to the countries to which they belong. Be ready to repeat from Test Map.
2. Make a list, with symbols, of the towns marked in brown or blue, grouping them by countries. Be ready to repeat from Test Map.
3. Into what parts is Borneo divided, and what countries have a share in it?
4. What places would be touched at by a steamer (a) from Suez to Shanghai, (b) from Karachi to Tokio (i.e. Yokohama)?
5. To what places do steamer routes go from Calcutta, from Yokohama?
6. In a train journey from Madras via Calcutta to Karachi, what places would you pass?

1. Write a list, with symbols, of all political divisions, including islands, saying to what countries they belong. Write down the names of all the towns in each division, with their symbols. Be ready to repeat from Test Map.
2. In a journey by train from Hankau to Berlin, what towns and river valleys would you pass in order?
3. Discuss the results, commercial and political, of a railway through Asia Minor to the Persian Gulf.
4. Write down, with symbols, nine rather small islands, or groups of islands, belonging to Great Britain in this map.
5. Say what Russian and British railways reach the borders of Afghanistan. What is the significance of this? What are the three towns in Afghanistan to which they point?

ASIA.—Political.



(Modified Conical Projection)

Scale 1:50,000,000 (1 inch = 790 miles) 0 200 400 600 800 1000 Statute Miles

North America.

Geographical Dates.

| A | B | C |
|---|---|---|
| 1492. Discovery of West Indies by Columbus. | | |
| 1497. Discovery of mainland of N. America by Cabot. | | |
| 1500-1600. Spanish conquest and colonisation in W. Indies, Mexico, and Florida. | | |
| 1605-1763. British and French colonisations in North America. | | 1609. Virginia founded, first British colony. |
| 1763. End of Seven Years War. Canada secured for Great Britain. | | |
| 1778. Independence of American colonies in New England, etc. | 1778. Cook's voyage | |
| | 1790-5. Vancouver's voyage. | 1789. George Washington first President of U.S.A. |
| | 1803. Louisiana bought by U.S.A. from France. | |
| | 1821. Florida bought from Spain by U.S.A. | 1820. Monroe doctrine declared. |
| | 1845-53. SW. of U.S.A. acquired from Mexico. | |
| 1867. Dominion of Canada formed. | 1867. Alaska bought from Russia by U.S.A. | 1867. Modern Mexican Republic begun. |
| 1898. Cuba and Porto Rico controlled by U.S.A. after war with Spain. | | |

Races and History.

A It may be said that the first hundred years after 1492 were chiefly noticeable for discoveries, the second hundred for genuine colonisation by France and Great Britain of the eastern coast from the St. Lawrence to Florida, the last hundred for the growth of the great Republic of the United States, and of the Dominion of Canada.

When Europeans first came to the continent, they found a race of simple savages spread over most of the continent. Their descendants are now inaccurately called "Indians," the name given to them by the early colonists, who expected to find India across the Atlantic. Where Mexico now is, the Spaniards came across a much more civilised race, the remains of whose remarkable architecture are still noticeable features of that country.

As a result of historical causes, most of the United States and Canada is peopled by English-speaking Europeans.

An exception is the Province of Quebec, where French is still a common language. Mexico is peopled partly by Spanish-speaking Europeans, and partly by a mixed race. The native "Indians" have dwindled to insignificant proportions everywhere, except in Mexico. Throughout the Southern States, on the other hand, the descendants of African negroes, originally introduced as slaves to work the plantations, are rapidly increasing in numbers, and are becoming a serious inconvenience to American politics.

Britain, France and Spain have been the leading European nations in the civilisation of the continent. Only the first of these nations has retained any considerable territory which is politically attached to the mother country.

B It is important to realize how much later the western part of the continent was discovered, and occupied by Europeans, than the eastern.

Though the Pacific coast had been partially explored by earlier Spanish sailors, it was not until the voyages of Cook and Vancouver that any detailed knowledge of that sea-board was acquired by Europeans. The number of European inhabitants of the Pacific slope remained small, until the discovery of gold about 1850 brought a rush of population to California and British Columbia.

The States for the first twenty years after the War of Independence did not extend west of the line of the Mississippi-Missouri, and did not expand to their present limits in the south-west until nearly another fifty years later.

Alaska was thought by many to be a useless country, when the United States bought it from Russia for about £1,500,000 in 1867. Since then it has proved its commercial worth by the development of the sealing industry in the islands of the Bering Sea, and of the gold mines of the coast and of the Klondike region, which extends into this territory.

The opening out of the Yukon valley, as a result of the discovery of gold, has given a high value to the strip of island-studded coast which extends far southwards towards British Columbia. Again the development of the wheat-fields of the north-west of Canada has made the harbours of that coast of value as possible termini for future railways across the mountains to the Pacific.

C The names in a map of North America in a reference atlas are themselves almost sufficient to show the areas occupied by various races at different times. While native names appear throughout the continent, Spanish ones predominate in the south, English everywhere north of Mexico, while French is often to be found in the place-names of the Mississippi basin (the old Louisiana) and along the St. Lawrence.

The history of Mexico is worth considering. From its conquest by Cortez, in 1521, it remained Spanish for exactly 300 years, until 1821, when the long struggle for freedom was successful. After a period of unrest, during which for two short spaces it was an Empire, Mexico finally became a fixed and prosperous Republic in 1867; but not until much of its territory had been taken from it, as a result of a war with the United States in 1847.

A In the map on the Plate 41 comparatively few details will be found for the United States and Canada, as the former are treated more fully in the following pages, while Canada is specially dealt with in Part VI. Central America and the West Indies belong to Part V. There remains then—

Mexico.

Structure, Climate and Products.

Judging from the map, it is obviously of high average elevation. Two parallel mountain-folds extend from north-west to south-east, from the border of the United States to the Isthmus of Tehuantepec. Between them is a high plateau of peculiar construction (averaging about 7,000 feet in altitude). For the most part it is the result of a filling up of earlier valleys, partly with detritus from the surrounding mountains, but still more noticeably by volcanic debris. The highest mountains in Mexico are active or recently extinct volcanoes.

The climate naturally varies more according to altitude than to latitude, though the great difference between north and south must not be neglected. The Mexicans recognize three zones:—

- (1) The Hot zone, extending from sea-level up to about 3,000 feet, largely covered with dense tropical jungle, with palms, rubber-trees, and mahogany. Coffee is here the most promising cultivated plant.
- (2) The Temperate zone, from 3,000 to 5,000 feet, with vegetation gradually changing from the palms and orchids of the tropics to the evergreen oaks of Southern Europe.
- (3) The Cold zone, above 7,000 feet, where oaks gradually give way to pines, forests of which extend up to 10,000 feet.

The rainfall of Mexico, as is clearly brought out in the map on Plate 37, comes almost entirely in the summer months, when the north-east trades are well to the north, and the lower barometer of the land areas draws in winds from the sea.

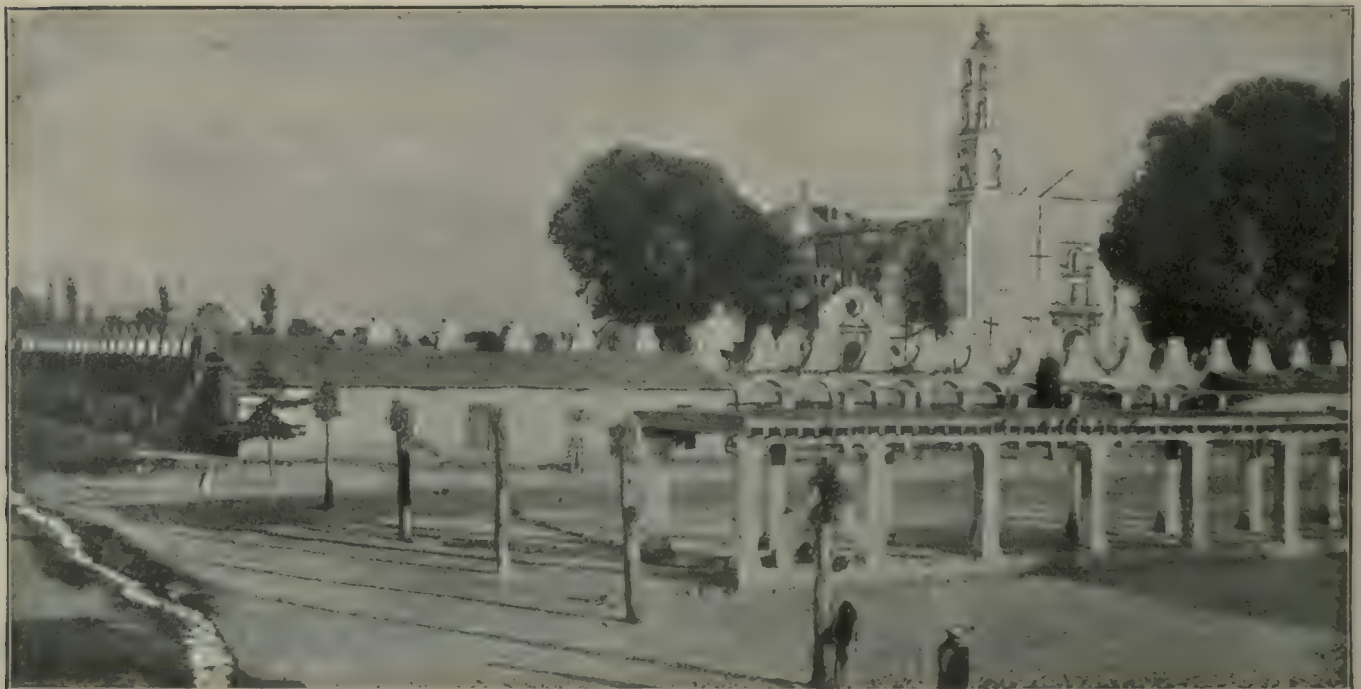
There is also a marked decrease of rain from south to north. Hence, in Northern Mexico trees give way to open grass country, admirably suited for the rearing of sheep, cattle, and horses—the home of the Mexican “cow-boy”

The unequal seasonal distribution of rain causes the rivers to vary greatly in volume, and makes irrigation of supreme importance to successful agriculture in many parts of the country.

Mexico has immense mineral wealth, and in the production of silver, copper and lead takes a high place in the world.

QUESTIONS AND EXERCISES.

1. Between what latitudes does Mexico lie? Does the tropic divide it into two nearly equal parts?
2. Mexico city is about 7,000 feet above the sea. Allow 1 degree for each 300 feet, and compare its temperature in July and January with that of Vera Cruz, New York, and London.
3. When is the rainy season in Mexico? How does the north compare with the south in the amount received?
4. What parts of Mexico are comparatively low? Would you expect Yucatan to receive more or less rain than the eastern slope of the plateau?
5. What countries, rivers, or seas form the boundaries of Mexico?
6. Name four big towns in other continents which are in approximately (within 5 degrees) the same latitude as Mexico city, either north or south of the equator.
7. Compare the position, as to latitude, of the Euphrates, Ganges, Yangtse, and Orange rivers, with that of the Rio Grande del Norte. Do any of these suffer from seasonal drought in the same way as the Mexican river?



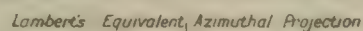
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[Photolith. Co., Ltd.]

FIG. 138.—A MEXICAN VOLCANO.

This is one of the highest mountains in Mexico (Popocatepetl). It is just south of the capital. Give its latitude and longitude. Judging from the vegetation in which zone was the photograph taken? The mountain is nearly 18,000 feet high. Compare this with Mont Blanc, the Himalayas, and Ben Nevis. Notice the snow, even during the summer, within the tropics. The buildings show the influence of Spanish Roman Catholic architecture. The view was taken looking south. What time of day was it, judging from the shadows? Near what hour does the sun set at the equator?

11



NORTH AMERICA.—Political.—Test.



B The mountainous peninsula of Lower California seems to be continued by the range that runs along the coast to the south-west of the line which joins Mexico city and Guadalajara.

There is obviously a very deep depression between it and the mainland, probably the result of a sinking of the earth's crust between two parallel faults.

The rainfall is somewhat unevenly distributed, owing to the configuration of the country. Most of the rain is naturally wrung from the clouds as they ascend the mountain slopes from the sea. As they drop slightly into the central plateau, less moisture is to be expected. Thus the twenty-five inches of annual fall at Mexico city contrast with over 100 inches at several points along the eastern slopes of the plateau. Wheat, not unexpectedly, becomes an important crop in the drier parts above the hot zone.

In Yucatan especially, and in many other parts, the American aloe yields sisal-hemp, a tough fibre of great commercial value. From the same plant is made by fermentation the national drink of Mexico, "pulque," the cheapness of which leads to much misery among the lower classes.

The hot zone also produces successfully, for export, oranges, bananas, cocoa and sugar.

QUESTIONS AND EXERCISES.

1. What are the two peninsulas of Mexico? Compare them as to latitude, surface, rainfall, and natural products.
2. Write down, with symbols, all names mentioned in brown or blue, in Mexico, and be ready to repeat from the Test Map.
3. A railway has been completed across the Isthmus of Tehuantepec. How far is this likely to compete with other inter-oceanic routes?

C As the highest peaks of Mexico are found within the tropics, there are few regions of perpetual snow. It is only above 15,000 feet that the conditions are favourable. Glaciers are found on only one mountain in Mexico. The rivers, therefore, gain practically nothing from such a source, as opposed to the Alpine rivers of Europe.

As a result of the structure of Mexico, communication between the capital and the coasts has presented great difficulties. Only recently have railways at great cost been built up the steep slopes of the plateau. Railway development on the plateau has been less difficult, as the various lines which come southwards from the States testify. These are mainly through routes to the capital, and have to traverse much arid and non-productive country near the northern frontier. By their means, much trade is taken overland, to the detriment of oceanic commerce with Great Britain.

QUESTIONS AND EXERCISES.

1. Compare Mexico with the Iberian peninsula as to surface, climate, products and commercial progress.
2. Write out a list, with symbols, of all names in Mexico. Be ready to repeat from Test Map.
3. Discuss the difficulties offered to communications in Mexico. How do these affect the competing trades of the United Kingdom and the States? What inter-oceanic routes are there in Mexico?

Political Divisions, Communications, etc.

A It will be noticed that in the map on Plate 41 the chief localities for gold, silver and copper are marked throughout the continent, that coal-fields, metalliferous and industrial regions are put in only if outside the States, as there is a special map to show that area later.

Only the leading through railways are inserted. In Canada, the Grand Trunk extension from Quebec to Winnipeg is in course of construction (1906).

As silver-producing countries, Mexico and the States lead the market. Canada, with her rich supplies of gold in the Klondike and British Columbia, is rivalled only by the United States, South Africa and Australasia, as a producer of that metal.

The United States provide half the copper used in the world, and, as to lead, share with Spain the first place.

QUESTIONS AND EXERCISES.

1. Write a list, with symbols, of all political divisions and towns, marked in brown. Be ready to repeat from Test Map.
2. To what countries are Alaska, Jamaica, Porto Rico, Bahama Islands, and Bermudas attached?
3. What part of British North America, though on the mainland, does not belong to the Dominion of Canada?
4. Name four British naval stations, and two in United States. (N.B.—The naval stations in Canada are not now kept fully equipped, but would be easily re-established in case of need.)
5. Name the most characteristic exports from Halifax, Vancouver, Boston, Philadelphia, New Orleans, San Francisco, and Havana.
6. Name four inter-oceanic railways in Canada and the States, in order, from north to south. Name the important towns on each.
7. In what river basins are Chicago, St. Louis, Montreal, Winnipeg, Denver?
8. In what parts of the continent are the precious metals chiefly found?
9. In what parts of the continent, outside the States, are there coalfields?
10. In the all-British route from Liverpool to Japan what places in Canada would be passed through in winter-time? What variation would be likely in summer?
11. Compare the latitude of the most southerly point of Canada with that of London and Naples; the latitude of the most southerly point in the States with that of Cairo and Calcutta.
12. Between what degrees of latitude and longitude are Canada and the United States respectively contained?
13. Compare roughly the distances between New York and Chicago, and London and Edinburgh; the size of Lake Superior and of Ireland, of Alaska and of the British Isles.
1. What canals are there marked in connexion with the great lakes? Say in each case what difficulties they surmount. What kind of traffic would you expect to find on them?
2. Write a list, with their symbols, of all names of countries and towns in brown or blue. Be ready to repeat from the Test Map.
3. What places would a traveller pass in a journey (a) from Washington to San Francisco via Southern Pacific; (b) from New York to Vancouver via Canadian Pacific; (c) from Vancouver to Philadelphia via Northern Pacific?
4. To what places are sea routes marked from New Orleans, San Francisco, and New York?

1. Write a list, with symbols, of all towns in the map, and be ready to repeat from the Test Map.
2. What ports export (1) cotton, (2) wheat, (3) timber, (4) sugar, (5) tobacco?
3. When it is noon at Greenwich, what time is it by the sun at Charleston, New Orleans, Mexico City?
4. Taking lat. 40° as the most suitable for all purposes, as a rule, can you think of any country in the world so favourably situated as the United States?

The United States.

A From the preceding pages and the general maps of the continent, the surface features, structure, climate, and natural vegetation of the United States can be studied. In the map on the next page, the distribution of minerals, and some of the leading artificial lines of communication by rail and canal are shown.

On these data it ought to be possible to a large extent to account for the distribution of population, the position of the great towns and ports, and the localisation of certain trades and industries. As raw material is more cheaply transported to the fuel or source of energy than vice versa, nearly all the manufacturing centres must be on or near coalfields, or have natural water-power close at hand. Most of the coal of North America, as can be seen from the map, lies between the Mississippi-Missouri and the Atlantic. Far the most important coalfields lie around Pittsburg, and as large supplies of petroleum and natural gas are found near, this town has become the centre of the iron industry.

Local supplies of ore are largely supplemented by imported ores, chiefly from the shores of Lake Superior, whence there is easy water-carriage by lake and canal to the centre of the coalfield.

Next to Pennsylvania and Ohio comes Illinois as a producer of coal and iron. Copper, though not indicated on the map, is one of the leading products of the States. The supply of this metal is not only sufficient to meet the enormous home demand, but also to feed a large export.

The rich mines of California and Alaska make the United States one of the leading gold-producing countries in the world. In the extraction of silver, the States easily lead among the nations—Colorado, Nevada and Montana being the richest districts.

Almost all along the coastal strip between New York and Portland, there is abundant water-power available, and hence there have grown up a large number of towns engaged in almost every kind of manufacture. The cotton manufactures of Massachusetts are perhaps the most noticeable. Here, as in Lancashire, a naturally humid atmosphere is specially suited for the spinning and weaving of the raw material. In dry seasons auxiliary steam-power is of course freely used.

If this map is compared with the Vegetation Map on Plate 38, it is not difficult to account for the great concentration of population and of great towns on each side of latitude 40° between the Missouri and the sea.

The wheat and maize of the central states have to be brought to the great manufacturing centres, or exported to foreign countries. Hence the growth of great distributing towns such as Chicago, St. Paul and Minneapolis, and St. Louis. The huge meat trade of Chicago and Cincinnati depends almost entirely upon the swine and cattle fed upon these grains, especially maize.

The great ports of the Atlantic coast are nearly all concentrated in this belt, that is, between the productive areas and Europe. Their exact position can usually be easily accounted for by their physical surroundings. Nearly all the deep inlets which penetrate towards the west have great towns at the farthest limits of ocean navigation, where safe harbours can be found. The relative growth of these towns has depended upon their comparative distance from great producing regions in-

land, the natural avenues across the Appalachians, and in a lesser degree upon their comparative distance from Europe. The fact that the Hudson River is deep and navigable for steamers as far as Albany has been the chief cause for the pre-eminence of New York, which deals with nearly half of the entire foreign trade of the country. This great submerged valley not only gives easy access across the mountains to the great lakes and the West, but opens up a direct line to Montreal, the commercial centre of Canada.

Baltimore is the natural port for rail-borne wheat from St. Louis, the great collecting place for this commodity. Philadelphia of course gets a large share of the traffic to and from the great manufacturing area immediately to the West. When the St. Lawrence is ice-blocked Boston's trade is increased by much lake traffic, though the manufactures of her immediate neighbourhood are her chief support. When it is remembered that the natural products of the South are entirely different from those of the North, it is easy to understand the enormous traffic which must go by rail and river along the Mississippi valley. Though railways are rapidly diminishing the number of river steamers, yet the mere existence of this cheaper form of transport has a wonderful influence in keeping down the cost of freight.

Minneapolis and St. Paul, at the head of river navigation, with water-power at hand, in the midst of a great wheat country, have perforce become important flour producers, and the collecting towns for the traffic of the South.

Chicago, where the great lakes reach farthest south, with easy country between it and the Mississippi basin, at the point where great lines of rail must converge from east and west, has, of necessity, become the largest lake-port in the world.

The ocean port of the Mississippi is New Orleans—100 miles from the sea, at the most convenient place for the transshipment of goods from river to ocean steamer. From here, naturally, much raw cotton is sent to Europe, while the fruits of the West Indies are sent up the river to the great cities of the North.

B Wherever narrow necks of land intervene between the great lakes there must, of necessity, be a crossing of land and water routes, and at these points towns are sure to grow up.

As the lakes are not all on the same level, the falling water is usually rapid, and was not navigable until canals were constructed. These natural falls have now been used for water-power, especially at Saulte St. Marie (pronounced Soo) and Niagara.

A comparison between the Climatic Maps on Plates 36 and 37 and the Structure Map on page 76, makes it easy to see how the products of North America arrange themselves in belts from east to west.

Between the Appalachians and the sea, the coastal plain is well watered, and produces trees on the slopes, or where the land is naturally too sandy for agriculture. Wherever the soil is of clay or marl, farming is highly developed. As the climate gets warmer, the grains and orchards of the North give way in turn to the tobacco of Virginia and the cotton of the Carolinas and Georgia. Great trading ports and manufacturing cities are common, especially in the North, for the reasons explained above.

The Appalachian belt of older rocks is rich in coal and iron and, especially in the North, supports great manufacturing centres. Its lower portions are often richly cultivated, its uplands naturally thinly populated, especially about latitude 36° . Westward of this region, the level prairies, with their rich soil, hot summers and lesser rainfall are covered by wheat and maize. Farther South the coastal plain along the Gulf is again a great cotton-growing country.



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FIG. 139.—AN AMERICAN MAIZE FIELD.

This place lies in latitude 39° N., longitude 95° W. In what State is it? The maize is in flower. What is the other common name of the seeds in this country? How can you judge of the height of the plants?

As the rainfall decreases and the elevation increases, the country becomes less and less suitable for the plough, and wheat and maize and cotton gradually give way to pasture-land. Hence the ranching of the great plains.

The Rocky Mountains, on their eastern slope, have large areas covered by pine forest, especially to the north. In Canada, all their lower portions are so covered, and the belt of trees of course becomes more vigorous on the Pacific slope, where it extends as far south as the border of Mexico. In those mountain regions minerals again become of importance.

In the South-western states the elevated Columbia and Colorado plateaus and the Basin ranges are often deficient in rainfall, and are therefore treeless and barren, except in favoured places. This dryness is especially noticeable in the South.

The lower valley of the Sacramento river is naturally of great fertility, and gives to San Francisco a great export of wheat.

The gold of California made water a necessity, and when once this had been brought by artificial channels from the hills, it enabled the soil to become fertile. Now the fruits and wines of California have proved of more lasting value than her gold.

The tree-covered Pacific ranges have caused the great timber trade of Portland and Seattle.



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FIG. 140.—IN AN AMERICAN COTTON FIELD.
This scene is in latitude 32° N., longitude 83° W.; in what State is it? Of what race are the workers? The white fluff encloses the seed. The longer the fibres are in this "cotton-wool," the more valuable is it, usually. Why is this?

In using the map on Plate 43, care must be taken as to the inferences to be drawn from the existence of regions rich in iron ore and coal. Coal varies enormously in quality, as well as accessibility; and it is only where really good coal can be easily worked that great industrial centres have sprung up. Iron ore, even if good, cannot be worked at a profit unless it can be cheaply transported to coal. Again, districts far inland, or removed from means of transport, cannot develop the manufacture of heavy goods.

It would be as impossible as useless to represent all the railways of Southern Canada and of the States. Only the most important lines have been inserted.

The leading exports were graphically shown on the preceding map. They are here omitted for want of space.

Organisation of the States.

Each state is practically self-governing with a Senate, House of Representatives, and a Governor —all elected. In most states, all men over twenty-one years of age have a vote.

The Federated States, as to their outside policy and general government, are under Congress, which consists of a Senate (two members sent by each state), and a House of Representatives, whose members are apportioned to each state, according to population. They are elected by all who hold the franchise in each state. The list below gives the states in order of population. New York State has thirty-seven representatives, while six states have only one—out of a total of 386.

Outside this map there lie the possessions of Hawaii, Porto Rico, the Philippines, and Alaska, none of which yet count as states.

The District of Columbia (D.C.) practically corresponds to the City of Washington. It is used as the seat of government, and within it no citizen has a vote for any purpose.

The abbreviations given below are worth learning, as they are commonly used in postal addresses. The actual populations are inserted only for reference, and must not be learnt.

The District of Columbia would come between North Dakota and Utah by order of population.

| | NAME OF STATE. | ABBREVIATION. | POPULATION
IN 1900.
In thousands. |
|---------|---|-----------------|---|
| I | New York | N. Y. | 7,269 |
| II | Pennsylvania | Pa. | 6,302 |
| III | Illinois | Ill. | 4,822 |
| IV | Ohio | O. | 4,158 |
| V | Missouri | Mo. | 3,107 |
| VI | Texas | Tex. | 3,049 |
| VII | Massachusetts | Mass. | 2,805 |
| VIII | Indiana | Ind. | 2,516 |
| IX | Michigan | Mich. | 2,421 |
| X | Iowa | Iowa | 2,232 |
| XI | Georgia | Ga. | 2,216 |
| XII | Kentucky | Ky. | 2,147 |
| XIII | Wisconsin | Wis. | 2,069 |
| XIV | Tennessee | Tenn. | 2,021 |
| XV | N. Carolina | N. C. | 1,894 |
| XVI | New Jersey | N. J. | 1,884 |
| XVII | Virginia | Va. | 1,854 |
| XVIII | Alabama | Ala. | 1,829 |
| XIX | Minnesota | Minn. | 1,751 |
| XX | Mississippi | Miss. | 1,551 |
| XXI | California | Cal. | 1,485 |
| XXII | Kansas | Kans. | 1,470 |
| XXIII | Louisiana | La. | 1,382 |
| XXIV | S. Carolina | S. C. | 1,340 |
| XXV | Arkansas | Ark. | 1,312 |
| XXVI | Maryland | Md. | 1,188 |
| XXVII | Nebraska | Nebr. | 1,066 |
| XXVIII | W. Virginia | W. Va. | 959 |
| XXIX | Connecticut | Conn. | 908 |
| XXX | Maine | Me. | 694 |
| XXXI | Colorado | Col. | 540 |
| XXXII | Florida | Fla. | 526 |
| XXXIII | Washington | Wash. | 518 |
| XXXIV | Rhode Island | R. I. | 429 |
| XXXV | Oregon | Ore. | 414 |
| XXXVI | New Hampshire | N. H. | 412 |
| XXXVII | South Dakota | S. Dak. | 402 |
| XXXVIII | Oklahoma | Ok. | 398 |
| XXXIX | Indian Territory (now absorbed in Oklahoma) | | 392 |
| XL | Vermont | Vt. | 344 |
| XLI | North Dakota | N. Dak. | 319 |
| XLII | Utah | U. | 277 |
| XLIII | Montana | Mont. | 243 |
| XLIV | New Mexico | N. M. | 195 |
| XLV | Delaware | Del. | 185 |
| XLVI | Idaho | Id. | 162 |
| XLVII | Arizona | Ariz. | 123 |
| XLVIII | Wyoming | Wy. | 93 |
| XLIX | Nevada | Nev. | 42 |

QUESTIONS AND EXERCISES.

1. Write a list, with symbols, of all towns mentioned in brown in the United States. Be ready to repeat from Test Map.
2. Where are the Alleghany plateau and Chesapeake Bay? What port is at the head of the latter?
3. Account for the importance of St. Louis, Chicago, Pittsburg, Philadelphia and New Orleans.
4. Name the five most populous cities in the United States; the five most populous states.

1. Write a list, with symbols, of towns mentioned in brown or blue in the United States. Be ready to repeat from Test Map.
2. Where are the Yellowstone Park, Delaware Bay, Delaware River?
3. Account for the importance of Cleveland, Buffalo, Minneapolis, and Louisville.
1. Write a list, with symbols, of all the towns mentioned in the States. Be ready to repeat from Test Map.
2. Find in the map the White Mountains, Adirondack Mountains, Lake Champlain, Long Island, Blue Ridge, and the Black Mountains. Be ready to locate these on the Test Map.
3. Write a list of the North Atlantic States, with their symbols (i.e. the nine states north of lat. 40° and east of long. 80°, including N. J.). Add any towns mentioned in each. Be ready to repeat from Test map.
4. Do the same for the South Atlantic States (i.e. the states south of Pennsylvania near the ocean, including W. Va.).
5. Do the same for North Central States (i.e. the thirteen states which lie chiefly north of lat. 37° and between the Atlantic states and long. 104°, including Kentucky).
6. Do the same for the South Central States (i.e. the seven states which lie between the North Central States and the Gulf of Mexico).
7. Do the same for the Western States (i.e. the eleven remaining states west of long. 104°).
8. Write a list, with symbols, of the states bordering the Atlantic, in order from north to south (fifteen, including Pa.) Be ready to repeat from Test Map.
9. Do the same for (a) the four Gulf States (from east to west), (b) the three Pacific States (from south to north), and (c) the twelve states which border Canada (from west to east).
10. Follow the Mississippi-Missouri from the Gulf to the southern border of North Dakota, and say what states would be on the east and west bank in order. Be ready to do this from the Test Map.
11. Pick out the state with largest area, with smallest area. How many states have a greater population than London (6,500,000); how many than Paris (2,700,000)?

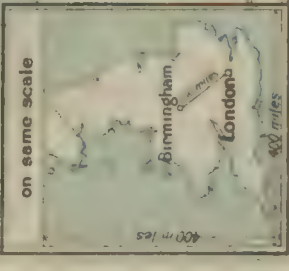


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FIG. 141.—A CUBAN SUGAR FIELD.

Near Havana. What is the latitude? Of what race are the natives? Whence did they originally come? The plant resembles a thick reed. The stems, of about one inch in diameter, are cut off near the ground, stripped of their leaves, and taken to the sugar-mill for treatment. The workers are here sitting on the cut-off leaves. In the background can be seen the standing plants.

UNITED STATES.



Scale 1:20,000,000 (316 miles = 1 inch)

UNITED STATES.—Test.



China, Corea, and Japan.

A The map on Plate 45 is designed to show the important areas of China proper and Japan proper, and their chief products—vegetable and mineral.

Structure, Climate, Products and Trade.

The physical colouring shows that, generally speaking, the greater part of these countries is mountainous. China alone has any considerable plains. The basin of the middle Yangtse is divided from the great plains of the north by a mountain barrier that extends from Tibet east and then south-east to the river east of Hankau. Throughout most of its course this range is difficult to cross, and has prevented easy communication between the great towns of inland China. Geologically also, it separates the older rocks of the north, with their true coal measures, from the new rocks to the south, with inferior coal of later age.

The great trunk railway, which will eventually be continued southwards to Canton, surmounts its eastern extremity by a comparatively easy pass, and helps to make Hankau one of the greatest commercial centres of China.

The Climatic maps on Plate 37 indicate that all these countries are well within the monsoon area; that is, they receive most of their rain during the summer months. Thus it is that summer crops flourish, and the land is able to bear a very heavy population, largely dependent upon agriculture. Irrigation is not necessary in most districts, though its value is fully understood. The chief exception is for rice crops everywhere, and for the peculiarly porous but fertile soil of Northern China.

In Southern China the characteristic crops may be said to be rice on the lower ground and tea on the hill slopes, though almost all the products of warm, temperate climates are to be found in the land cultivated by the industrious Chinese husbandmen.

In Northern China, cotton and wheat are the leading crops.

Mulberry trees are grown almost everywhere to feed silk-worms.

The export of silk in its raw and manufactured state is far the most valuable item of China's foreign trade, three times more so than the value of exported tea. In Japan, also, the silk trade is of great importance.

Coal is widely distributed over China, but is only just beginning to be worked on a large scale on scientific principles. The coalfield to the north-east of the great bend of the Hwangho is probably the richest in the world. It is of enormous extent, its seams are of great thickness and good quality, are near the surface—often on it—and are not disturbed by faults or folds. As excellent iron ore is found in the same district, the possibilities of industrial development here seem almost boundless.

Corea and Japan resemble each other in their mountainous surface, though the former has rather more low-land, especially on the east. Both have ample rainfall, and are capable of producing very prolific crops, wherever the character of the surface allows. Japan, with



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FIG. 142.—TEA PICKING IN JAPAN.

Notice the Japanese characters on the headdress, etc. The young shoots of the tea shrub make the best tea. These are dried and rolled for the market. Notice how the leaves open out in the teapot. Japan is subject to frequent earthquakes. Does this account for the style of architecture? What inference as to the rainfall would you gather from the tree-covered slopes?



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FIG. 143.—ABOVE THE CLOUDS IN JAPAN.

View taken from the summit of Fujiyama looking north-east. The Japanese pilgrim stands upon the cinder slope of the crater. The day is clear and windless. The water-vapour near the surface has condensed into clouds, owing to the colder layer of air, caused by peculiar conditions, near the earth. The sun's heat is gradually dissipating the clouds. Such a view is common in mountainous countries, when the barometer is high and the weather clear and cold. Notice the typical mountainous scenery of Japan, the shape of the lake, the signs of erosion by water-courses, and the peculiar hat of the climber (showing the heat of the sun).

her forty-five millions of inhabitants, has already utilized to a large extent her fertile land, amounting to less than one-third of the total area. Corea awaits development, and will, no doubt, soon be overrun by Japanese colonists.

As in much of China, rice and beans are the staple crops of Corea; rice, tea and silk are the leading products of Japan.

Valuable coal mines are worked in both the north and south of Japan, and, together with her natural water-power, have enabled great textile and steel industries to grow up. Japan is thus fast becoming a manufacturing country, as opposed to China, where agriculture and trade are the leading occupations.

In all these countries, roads are generally bad or non-existent. The Japanese have partially overcome the difficulties of inland transport by means of railways, but their mountainous country is against them. In China, railways are just beginning to show their enormous value. Both countries make every use of their rivers or seas as means of carriage.

Nearly all the towns owe their importance to their position in rich agricultural centres, of which they act as the markets, or to their being the natural outlets of great river valleys to the sea.

Thus Canton is the natural trading focus of the rich river delta upon which it stands, while Hongkong acts as the ocean port for traffic which is collected and distributed by coasting steamers and junks from the whole of Southern China. Hankau, at the junction of waterways, amid a rich agricultural region, is the natural collecting centre of the enormous river traffic of the Yangtse basin. The trunk railway, from north to south, will of course increase its importance. For this great valley, Shanghai is the ocean port, the nearest safe harbour to the somewhat difficult river mouth.

Tientsin, similarly, is the port of the northern plains, though not able to admit large steamers owing to lack of water. Peking's position is important, more from strategical reasons.

Osaka, Tokio and Kioto stand upon the richest plains of Japan. The latter for more than a thousand years was the capital. Tokio cannot be reached by large ships, and hence Yokohama has become its out-port.

B Much of Northern China is covered with the peculiar "loess" formation. This consists of a deep mantle of material apparently blown, in the form of dust, from the deserts of the interior. It is rich in lime, and easily weathers both horizontally and vertically. This results often in very remarkable scenery. Even the valleys in the mountainous middle course of the Hwangho are partially filled by this peculiar deposit. It is most fertile, provided that it has plenty of moisture. Being very porous, it requires irrigation in a dry season.

The upper Yangtse, in the district around Chungking and right up to Yunnan, is also favoured by a peculiarly rich soil, red in colour, the product of the local rock. Wherever this is found, cultivation is possible high up the mountain sides, and the population is remarkably dense for such elevated and remote regions. Chungking, a treaty port, is the natural outlet for the trade of this district down the Yangtse.

Of Chinese rivers, by far the most valuable as a means of communication is the Yangtse, which is navigable for ocean steamers as far as Hankau, for river steamers as far as Ichang. Then there are 400 miles of difficult navigation up to Chungking, where once more the great river and its tributaries are free of interruptions for long distances. The great rapids of the Yangtse gorges have been passed by small steamers, but nearly all the traffic is hauled up in junks at great toil and risk. Railways will eventually, no doubt, partially solve the difficulty.

The Hwangho, even in its lower course, is difficult to navigate, owing to its uncertain course. It is liable to great floods, and often causes widespread destruction. As lately as 1888 it entered the Yellow Sea along the dotted line shown in the map. Above the point where it bends to the north it runs through deep gorges, where navigation is impossible. Singan, however, stands on a navigable tributary, and is one of the most energetic trading centres of China.

The Sikiang is navigable for junk traffic along most of its course, though rapids are not absent.

The Imperial Canal is still in good condition south of the Hwangho, and permits of boats which do not draw more than five feet.

From east to west, then, there are some natural means of transport. From north to south the deficiency must be filled by railways.

The competition for China's trade is, of course, keen among European nations, the United States and Japan. The United Kingdom still leads, and the trade that passes through Hongkong is almost as great as that of any other single port in the world. France hopes to get a large share of the commerce of Southern China, the United Kingdom of the Yangtse basin, Germany of the rich and populous district around Kiau-chau, while the United States and Japan are active at every trading centre.

C China is rich in great towns, whose names are unfamiliar to Western ears, but their importance is certain to become great in the near future, when railways have been more fully developed. Hitherto the corrupt governing officials have naturally been opposed to trade innovations. As a whole, however, it is untrue to say that the Chinese are hostile to Western improvements. They are born traders and honest business men, and are rapidly making use of scientific knowledge acquired in Europe and Japan.

At Siangtan, in the centre of the most exclusive part of China, is to be found a city larger than Birmingham, with a fully installed system of electric light and trams, and yet hardly known to Europeans. Its position on a natural trade route from the Yangtse to the Sikiang is easy to account for, and it will no doubt be on one of the great railway lines of the future, leading to Wuchang.

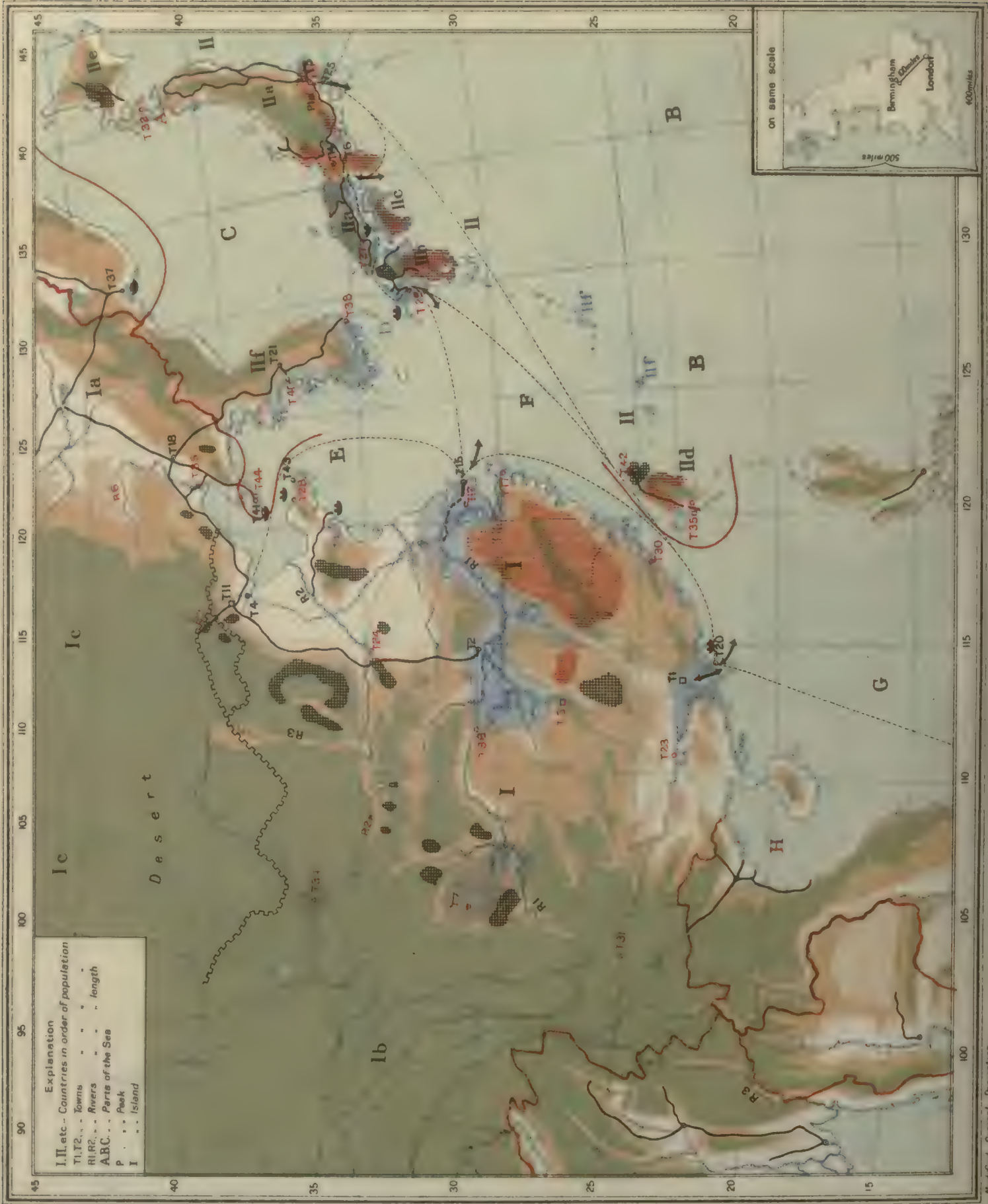
Ching-tu is the centre of the rich red-earth region of the upper Yangtse; Yunnan, on a high but fairly fertile plateau, is famous for its tea and minerals, and its trade is the object of much rivalry between Burma and Tongking, from both of which countries railways are projected. Singan, besides standing on a fertile plain, commands the great road which leads westward to the upper Hwangho and the Interior.

Wuchang is of importance for exactly the same reasons

CHINA & JAPAN.



CHINA & JAPAN —Test.



as Hankau, while Nanking holds a similar position lower down the river. It was the capital of China during the fourteenth century. It has silk manufactures.

Harbin, the natural meeting-place of rail and river, has rapidly become the chief trading town of Northern Manchuria.

Suchau is in a similar position to Nanking, and also manufactures silk.

Amoy and Ningpo, as treaty ports, are important for the same reasons as Fuchau. The treaty port of Niuchwang, some miles from the river port of that name, is the natural outlet for the considerable trade of the Liao river basin.

Kobe is the second port in Japan, and shares the rich trade of Osaka and the "Inland Sea" which lies between Honshiu and Shikoku. Nagoya is in the centre of the greatest rice district of the Empire, on the railway between the modern and ancient capital.

Chemulpo and Fusan are the obvious ports for Corea. Hiroshima and Nagasaki, owing to their fine natural harbours, have become great naval stations. The latter being near coal, has developed shipbuilding, as well as other manufactures.

Throughout Japan, and in many parts of China, cultivation is so intense as to leave no room for pastures. Hence there is a great dearth of horses, cattle and sheep. Milk and butter are rare luxuries, padded cotton clothes take the place of wool, meat is little eaten, and few Chinamen or Japanese can ride a horse.

Formosa, taken by Japan from China after the war of 1895, is mountainous and forest-covered on the east, with much rich low-lying alluvial soil to the west. Uncivilized Malays inhabit the former region; industrious Chinese produce much rice and sugar in the latter. Japanese enterprise and good government are rapidly developing its resources, which include coal to the north.

QUESTIONS AND EXERCISES.

1. What is the meaning of the physical colouring? How are the chief rice and tea districts indicated?
2. Mention any noticeable lowland areas. What rivers drain them?
3. Make a list of all names, printed in brown, with their symbols. Arrange towns according to their countries. Be ready to repeat from Test Map.
4. Name the two chief ports of China, and the leading one in Japan.
5. What are the chief products, vegetable and mineral, of these countries? What districts are richest?
6. Mention two British naval stations in China. With what ports has Hongkong got direct steamer communication?
7. Allowing 70 miles for a degree, how far in a straight line is it roughly from Peking to Hongkong, from Vladivostok to Nagasaki?
8. Compare in size Formosa and Wales, Corea and England, the Japanese Empire and the British Isles.
9. Corea reaches farther south than the extreme south of Europe. Why is its climate different from that of Southern Italy?

1. Write a list of all names in brown or blue, with symbols. Arrange towns by their countries. Be ready to repeat from Test Map.
2. What are the four most populous towns in this map?

Account for the importance of Wuchang, Kobe, Harbin, Chungking.

3. What four European nations hold territory on the coasts of China? Compare their commercial importance.

4. Compare the population of China (400,000,000) and Japan (45,000,000) with that of the United Kingdom (43,000,000), the United States (80,000,000), and the Russian Empire (141,000,000), by means of a diagram on squared paper, as on page 40.

5. Why is it that the China trade is so valuable? What obstacles are there in the way? What is its future development likely to be?

6. Peking corresponds with Naples in latitude, the mouth of the Yangtse with the mouth of the Nile. Account for the great difference in climate between these places.

1. Write a list of all names, with symbols. Be ready to repeat these from the Test Map.
2. Give an account of the communications of China and Japan.
3. What do you know of the "Loess" and "Red-earth" regions of China?
4. Account, as fully as you can, for the importance of Kaifong, Ichang, Nagasaki, and Siangtan.
5. Name all the ports and naval stations in China, Corea, and Japan. Which of these belong to European Powers?
6. Give some account of Formosa, its features, products, inhabitants, history, and trade.
7. Compare the January and July temperatures of London and Peking, of Tokio and Moscow (Plates 12, 25, and 36). Account for the differences.



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FIG. 144.—THE SACRED MOUNTAIN OF JAPAN.

Fuji-yama (or Fuji-san) is a perfect volcanic cone over 12,000 feet high. Notice the even snow line, a clear proof of the decrease of temperature owing to elevation, the cinder slopes and lava flows, overgrown by trees on the lower parts of the mountain. Is this a lake or the sea? Locate the mountain in the map, and give its latitude. Between what two towns is it situated? This hill is frequently depicted on Japanese screens and paintings.

Palestine.

Size, Position in the World.

QUESTIONS.

1. How far is it, roughly, from Jerusalem to Tyre, from south end of the Dead Sea to Mount Hermon, from Joppa due east to the Jordan, from Dan to Beersheba?
2. How many degrees nearer the equator is Jerusalem than London; than Naples?
3. At the present time, what country borders Palestine on the south-west; what on the east?
4. If you went due east from the Dead Sea, to what great river would you first come? If you went due south, to what sea would you come?
5. These maps are on a rather larger scale than the maps of England, Scotland, and Ireland (Plates 16 and 18). Compare the following as to area (say whether they are about equal, or if one is obviously greater than the other): The Roman Province and Yorkshire; Palestine (within the tribal divisions) and Wales; the distance from Dublin to Belfast, and the distance from Jerusalem to Damascus.

Surface.

The Physical Map shows five well-marked divisions of the land between west and east, between the sea and the desert: the Maritime Plain, the Low Hills, the Central Range, the Jordan Valley and the Eastern Range.

Great diversity of surface within a small space is a characteristic.

There is no instance elsewhere of such a remarkable depression below sea-level as the Jordan valley—a curious rift in the earth's crust, that may be looked upon as an extension northwards of the great hollow filled by the Red Sea.

B Limestone is the prevailing rock throughout the mountainous parts; hence the frequent allusion to caves in Hebrew history. The Central range is uneven and broken in the midst by the Plain of Esdraelon. The eastern mountains present a high wall towards the Jordan valley, and then continue eastwards as a fairly level plateau, and gradually merge into the elevated Arabian desert. In many parts volcanic rocks come through the limestone. Trachonitis is perhaps the most conspicuous example. It is a broken mass of black basalt.

C The Yarmuk and Jabbok obviously have worn deep trenches out of the eastern plateau.

To the north the mountains rise high round Hermon, and serve as a collecting place for the waters which feed the Jordan and the rivers of Damascus.

Climate.

A It would be hard to choose any small area where the influence of surface on climate is better illustrated than in Palestine.

Generally speaking, the winds come from the north in summer, and therefore bring little moisture. In the winter the winds come from the west and south-west chiefly, and naturally bring moisture from the sea. Its distribution is determined by the arrangement of hills and plains. The beginning of the wet season and its end are referred to in the Bible as "the former and the latter rains." The rains of autumn enable the farmer to sow his seed, the spring rains bring it to maturity.

The western slopes of the Central range and the Maritime plain are naturally exposed most to the influence of the sea, and enjoy a fresh and healthy climate. Mount Carmel first feels the rains, and is a mass of verdure in the spring. From its summit Elijah, after the long drought,



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FIG. 145.—ON THE FERTILE COASTAL PLAIN.

What sea is visible? Do you notice any evidence of Mohammedan architecture? In the foreground can be seen orange bushes and palm trees. Compare this vegetation with that of the adjoining view. Over most of Palestine the buildings have flat roofs; here most of them have ordinary roofs to resist the greater rainfall. In biblical times flat roofs were common; hence the frequent allusions to "on the house top." This is in about latitude 32° N. What are the ancient and modern names of the town?

watched for the clouds coming out of the west. Sharon and Phoenicia have been proverbial for their fertility.

The limestone uplands of Judaea are breezy and do not retain moisture, and have been throughout history the abode of a freedom-loving shepherd race. Hence the frequent metaphors from pastoral life in the Christian teaching.

East of Judaea, the eastern descent towards Jordan faces away from the sea, and is naturally dry and desert. The great trough of Jordan receives little rain, and depends for its fertility chiefly upon irrigation. It has an almost tropical climate. The western slopes of the eastern plateau receive most of what moisture remains in the west winds, and contribute many streams to the Jordan. Gilead and Bashan were thus able to support a forest growth in ancient times.

As the rain gradually gets less and less, so the sheep pastures of Moab and the north-east slowly merge into the desert plains of Arabia.

Owing to the very few meteorological stations in Palestine, the data for constructing an accurate Rainfall map do not exist. The map opposite gives an approximate idea of the mean annual rainfall. At Jerusalem accurate observations have been taken for forty years, at a height of 2,500 feet. The average fall there has thus been determined to be twenty-six inches, almost the same as in London. Its monthly distribution, however, has been very different. The five months of May, June, July, August and September do not get an average between them of even half an inch. December, January, February and March, taken together, get a mean of over 21½ inches. Summer then is practically rainless.

B The Annual Isotherms in the lowest map on Plate 3, show that Palestine lies in the belt between 64° and 80°. Local differences of level and exposure of course greatly modify the heat in various places. In Jerusalem, for instance, at 2,500 feet, the average for the last twenty years works out at a little

PALESTINE

The symbols are all in arbitrary order

HEBRON - brown names
ASHDOD - blue
Bethel - red



Scale 1:2,500,000 (39½ miles - inch) 0 10 20 30 40 50 Statute Miles



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[Underwood & Underwood, London and New York.

FIG. 147.—THE WILDERNESS OF JUDAEA.

Locate this in the Rainfall Map, and say why there is such scanty vegetation. The shrubs visible have hard leaves, so that evaporation is not easy, and long roots, suited for their surroundings. Compare the usual garden plants of Great Britain: why cannot they resist drought as a rule? Notice the effect of watercourses. How does a covering of vegetation resist denudation? From the uplands of Judaea, with their sheep pastures, a traveller in a few miles can find himself in an absolute wilderness, and by continuing eastward can easily within the day reach the rich tropical vegetation of the irrigated plains of Jericho.

over 62° ; the month of August averages about 76° , of January about 45° . Compare these temperatures with the seasonal averages in the British Isles (Plate 12).

At Jerusalem the air is seldom below 32° , or above 100° .

At Jericho, 1,200 feet below sea-level, what average would you expect for the year, for the months of August and January, allowing 1° for each 300 feet? Greater heat, however, is actually experienced there owing to its peculiar position.

QUESTIONS AND EXERCISES.

6. Make a tracing of the Physical Map, marking with horizontal lines in ink the land below sea-level, shading in pencil all parts over 1,200 feet, and putting in the symbols, for your section, instead of names. Use as test map.
7. What towns are above 1,200 feet; what below sea-level? (Place the above tracing over the lower two maps in turn.)
8. What is the difference in level between Mount Hermon and surface of the Dead Sea, between Joppa and Hebron?
9. Why does Carmel receive more rain than Jericho, Mount Hermon than Moab?
10. Make a tracing of Palestine in the time of the kings, marking by dotted lines all tribal divisions. Put symbols instead of names for these divisions and for the towns in your section (printed in heavy type), and bring up as a test map.
11. Do the same for Palestine in the time of Christ. Put political divisions instead of tribal divisions.

1. Make a tracing of the Physical Map (as in Question A 6), filling in all symbols for your sections (A and B), to be used as a test map.
2. Contrast the rainfall of the west and east of Judaea, of Moab and Phoenicia. Account for the differences.
- 3 and 4. Repeat questions A 10 and 11, with the symbols for your two sections.

1. Make a tracing of the Physical Map (as above), filling in all the symbols, to be used as a test map.
2. Make sections on squared paper, allowing one-tenth of an inch for each 500 feet vertically, due east and west, across the map (i.) through Mount Hermon and (ii.) through Hebron.
3. The mean monthly falls of rain in Jerusalem are: Jan., 6.4 inches; Feb., 5.1; March, 4.1; April, 1.5; May, .3; June, 0.0; July, 0.0; Aug., 0.0; Sept., 0.0; Oct., .4; Nov., 2.4; Dec., 5.7. Show this graphically by a curve on squared paper.
4. Similarly, the mean monthly temperature of the air at Jerusalem has been determined: Jan., 45° ; Feb., 48° ; March, 54° ; April, 61° ; May, 67° ; June, 73° ; July, 76° ; Aug., 76° ; Sept., 73° ; Oct., 69° ; Nov., 58° ; Dec., 50° . Show the result graphically.

5. Compare the mean annual temperatures of Jerusalem, London, Bombay, and Buenos Ayres (Plate 3). Compare the Jan. and July temperatures of Jerusalem and London (Plate 12).

- 6 and 7. Repeat questions A 10 and 11, with all symbols.



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FIG. 148.—BEIRUT.

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This is in about latitude 34° N., so just outside the map. Beirut is the natural seaport for Damascus, to which it is now joined by rail. Notice the vegetation, the style of architecture, the snow-covered mountains of Lebanon in the background, about 8,000 feet high. This view is typical of an eastern Mediterranean seaport. Is the harbour entirely natural? How does the rainfall here compare with that at Jerusalem and Damascus?

Notes on Countries without Special Maps.

(The Indian Empire is dealt with in Part VI. Its position in Asia and physical conditions may have been gathered from this part.)

A Turkey-in-Asia may be divided into (1) the plateau of Anatolia extending from the Ægean through Asia Minor to the confines of Persia; (2) the valleys of the Euphrates and Tigris, or Mesopotamia; (3) the mountainous district of Syria between this and the Mediterranean, and (4) the strip of Arabia along the Red Sea.

B The high plateau of Anatolia is generally treeless and somewhat bleak, with hot summers and cold winters, well suited in many parts for the growth of wheat. The coast districts to the north and south are naturally milder and are tree-covered.

The western slope towards the Ægean is often extremely fertile, and has a typical Mediterranean climate. Smyrna, its port, is rich and flourishing and does a great trade, especially in figs, raisins, and carpets. The native wool from the plateau is specially suitable for Turkey carpets.

Mesopotamia has lost much of its ancient fertility, which depended largely upon irrigation. Modern engineering would soon restore this, but capital is shy of Turkish provinces. Even now, the trade of Baghdad, the chief collecting town on the Tigris, and Basra, the ocean port, is not inconsiderable. How much hotter is Baghdad than London in July? (See Plates 36 and 12.)

Syria, including Palestine, which has been previously dealt with, is also a country that has not recovered from the ravages of centuries. Gradually it may regain its lost fertility. At present its agricultural population export wheat and fruits, but the trade is insignificant. The ancient city of Damascus, on its fertile plain, irrigated by the streams from Hermon, has Beirut as its port. It is a collecting place for desert produce.

Turkish Arabia is chiefly famous for its sacred Mohammedan cities of Mecca and Medina. Its southern portion has a fairly good climate, and is celebrated for its production of coffee.

C Independent Arabia consists of the plateau in the interior and the sultanate of Oman on the Persian Gulf.

The district of Nejd in the centre is by no means hopeless desert. It is the true home of the Arab and is famous for its breeds of horses and camels.

Oman is chiefly mountainous, and has close commercial and political relations with India.

A Persia can be seen from the map to be almost entirely an elevated country. Generally speaking, it is deficient in rainfall, and irrigation is necessary as a rule for agriculture. It has no great rivers. Along the Caspian Sea the greater rainfall causes a forest growth.

B Tobacco and wheat are characteristic agricultural products. Silk is largely produced in the north. The most valuable export consists of hand-made carpets.

C Politically, Persia is of great international importance. Russia is eager to get an outlet on the Persian Gulf, almost the whole trade of which is now in the hands of Great Britain. Germany also has

ambitions in this direction. The Anatolian railways are being built by German capital, and when the railway is completed from the Bosphorus to the Gulf, it will no doubt become a great trade route, and may do away with the British monopoly.

Afghanistan is of political rather than commercial interest, as a buffer state between the Russian and British Empires. The Trans-Caspian railway of the former gives an ominous dip towards Herat on the north, while the British strategical line through the Bolan Pass and Quetta aims straight at Kandahar, the centre where all roads meet. Most of the invasions of India have taken place by way of Kabul and the Khaibar Pass. Is any of this country below 3,000 feet? Would you here expect great extremes of temperature?

A Russian Central Asia consists largely of steppes and deserts. It is gradually getting more and more arid. The sea of Aral is shrinking. The rivers which rise in the mountainous district of the south-east are used fully for irrigation, and make fertile the country round Bokhara and Tashkent.

B Bokhara is a separate state, governed by an Amir, under Russian protection. Cotton is its most valuable product.

A Siberia, west of the Yenesei, is a vast level plain, well suited for wheat-growing in the south-west. The Trans-Siberian railway has now brought much of its naturally fertile land into actual occupation by Russian immigrants. East of the Yenesei, the country becomes much more broken. In the extreme east the volcanoes of Kamchatka are nearly as high as Mont Blanc.

B The mineral resources of Siberia are considerable, but owing to its remoteness, only the precious metals can be successfully worked. Fairly large amounts of gold and silver are found in the region to the east of Lake Baikal and along the upper courses of the Ob and Yenesei in the Sayan mountains

Tropical South-East Asia.

A Siam and French Indo-China may be regarded as monsoon countries, with the rainy season in summer. They are largely covered with forests and produce a certain quantity of teak for export. Most of the low ground is devoted to rice culture, upon which is based the trade of Siam and Cambodia. The large population of Tongking consumes all the rice that it produces.

B The French possessions have been enlarged at the expense of Siam. The Mekong valley, however, is by no means as important as it appears at first sight. Its mouth is difficult for navigation, and most of its course is too rapid for use by cargo-carrying vessels. The Menam is of far greater value, and in its valley is concentrated a dense Siamese population, who cultivate rice and tobacco as leading crops.

C The teak forests of these countries are of great potential value, but can be worked at a profit only when near rivers, by which the timber can be floated down to a port.

A The Malay Archipelago, with the exception of the Philippines, is chiefly within five degrees of the equator, where there is no distinct rainy season, but fairly heavy rainfall throughout the year. All these islands are covered by a dense forest growth, are largely volcanic, and produce, besides timber and rubber from

their forests, valuable supplies of coffee, sugar, tobacco and tea.

Java is by far the most important commercially. Her large population is well governed by the Dutch, in whose hands is the great bulk of her large export trade.

The northern island of the Philippines is much the most valuable, and produces the celebrated tobacco and hemp which take their name from Manila.

(The Straits Settlements, Federated Malay States, and British Borneo are treated specially in Part VI.)

B Sumatra, in spite of its size, is not of great commercial value, largely owing to its unhealthy climate. Its population is only one-seventh that of Java. Its trade and industries are similar to those in that island, but only in tobacco-growing does Sumatra rival Java.

Tin is a very abundant mineral in these regions, and the rich veins of the Malay Peninsula re-appear in the islands between Sumatra and Borneo, and are worked with commercial success.

C The Physical Map shows that most of these islands rest upon a submarine plateau and seem to belong closely to the mainland of Asia. The animals and plants found in Sumatra, Borneo, Java, and in a lesser degree the Philippines, are, as a rule, similar to those of the neighbouring continent. Between Celebes and Borneo, however, a deep strait intervenes, and south-east of this line—called Wallace's line, after the great naturalist of that name—the plants and animals have a distinct resemblance to those of Australia. The elephants, woodpeckers and pheasants of the islands to the north-east, are not found in Celebes, where the eucalyptus tree, birds of paradise, and pouched animals, are exactly the same as are to be found in Australia and New Guinea.

Here then is the true dividing line between Asia and Australasia.

REVISION QUESTIONS.

A 1. Compare China proper with the United States east of long. 100° as to extent, position in the world, climate, waterways and natural products. Do similar natural conditions prevail in the two regions?

2. Into what political divisions is North America divided? What is the chief town of each?

3. Account for the difference in climate and rainfall between the west of British Columbia and Labrador.

4. How does the most southerly point of Canada compare in latitude with London, Lisbon, and Athens?

5. Compare the Amur and the St. Lawrence as to position, size, and navigability.

6. For what reasons do you suppose have North America and Asia been treated together in this book?

7. Give the chief political divisions of the mainland of Asia, with the capital of each, where possible.

8. What parts of Asia and North America are most densely peopled? Account for the facts.

9. Write down the chief Asiatic islands belonging to Japan, Great Britain, U.S.A. and Holland.

10. Compare Asia and North America with the other continents as to area.

11. Write a list of the rivers of Asia, starting from the north-west corner, going round the coast in order.

12. Do the same for North America.

13. Compare the mountains of Asia and North America as to their extent and height, with the great mountain systems of Africa, Australasia and Europe.

14. Mention the five chief ports of each continent, and say what kind of trade they carry on.

15. Use the Trade Chart at the end of Part II, and say what are the leading exports of Asiatic produce to Great Britain.

16. Where are the chief coal-fields of these two continents, and how far are they developed?

17. If you went by sea from London via the Suez Canal to Yokohama, and then journeyed back to Liverpool via Canada, say what towns would probably be passed.

18. What countries in these two continents are partially within the tropics, and what partially inside the Arctic Circle?

B 1. Mention the driest and wettest parts of these continents, and give natural reasons for the facts.

2. Account, as fully as you can, for the importance of Karachi, Pittsburg, New York, Montreal, St. Louis, Shanghai, Yokohama and Rangoon.

3. Mention the chief naval stations in Asia and North America belonging to Britain. Explain the strategical importance of each.

4. Compare the parts of Asia and North America north of lat. 50° as to surface, climate, natural products and state of development.

5. What parts of these two continents produce the largest supplies of tea, rice, wheat, opium, jute, tobacco? Show how similar conditions in both continents lead to similar natural products.

6. Follow the coast of Asia from Suez to Vladivostok, and say in order what places and countries belong to European Powers.

7. Compare Sakhalin and Ireland as to latitude, and explain why their climates and products are so different.

8. What river valleys would a traveller cross in order on a railway journey from Moscow to Vladivostok?

9. Give some account of the waterways of China.

10. How far is it true to say that Asia was the starting point for the chief civilisations and religions of the world?

11. Describe the influence of elevation upon the climate and products of Mexico.

12. From what regions in these continents are large supplies of gold, copper, and tin derived?

13. Contrast the appearance of New York and Peking. How far are these differences due to geographical considerations?

14. Where are the great manufacturing regions of North America? What natural causes have led to their development?

15. Give some account of the climate and products of Java and Cuba. How far are the similarities to be accounted for by natural causes?

16. Look at the map of the North Polar regions near the end of Part I, and say what countries are cut by lat. 70° N.

17. From the same map calculate the distance between Québec and Lake Baikal via the North Pole; similarly between the Sea of Aral and Great Slave Lake.

18. Give an account of the physical characteristics of Palestine. How have these influenced the climate and vegetation in various parts?

C 1. If you travelled by the shortest possible route (i.e. a great circle) from London to San Francisco, and from London to Peking, describe what regions would be passed through on each journey.

2. Compare Japan and the British Isles as to their size, population, climate and geographical position. How far have geographical considerations led to similarities in their political development?

3. How could means of communication between India and Europe be improved? What physical or political difficulties are there for connecting railways to contend with?

4. Explain fully the causes of the monsoons of India and China, and their results upon rainfall and vegetation.

5. Mention the chief trading centres of Asia and North America, and show how geographical considerations have determined their growth.

6. What influence have ocean currents upon the climates of these continents?

7. What evidences are there in these continents of an Ice Age? What results upon the modern development of North America has the previous great ice-sheet produced?

8. What differences in seasonal climates are there between the eastern and western slopes of Japan? Explain the reasons.

9. Give some account of Persia, and of its commercial and political importance.

10. Describe the structure of Arabia, the Deccan, the Yosemite valley, the cañon of the Colorado River, Java, the plains of the lower Hwangho.

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(Fifth Term).

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(NOTE.—It is recommended to revise Plates 8 and 9 with the questions on page 29, at the beginning of each term.)

Position on the Globe and Comparative Size.

A look at Plate 47 will at once show that South America and Africa are the two tropical continents. The equator runs through almost the centre of Africa, and cuts South America near the mouth of the Amazon. Both continents have by far the greater proportion of their area within the tropics. Africa, however, has a considerable area north of Cancer, while South America has none. This disadvantage is partially counterbalanced by the fact that the southern portions of the Argentine Republic and Chile reach much nearer the Antarctic circle than does the Cape.

Great oceans or wide seas encircle almost the whole of both continents, the north-east of Africa being the only real exception, as the Red Sea is too narrow to have much climatic influence. The coast lines of both are, generally speaking, without indentations, and as a rule good harbours are scarce, in contrast to the eastern coast of North America or the much-indented Europe.

Many map projections fail to do justice to the huge bulk of Africa, but on Plate 8 the relative areas of land masses can be easily compared.

QUESTIONS AND EXERCISES.

1. Estimate by number of degrees the extreme lengths of South America and Africa (1 degree = 70 miles).
2. Compare the width of Africa along lat. 10° N. (1 degree = 68 miles) with that of South America along lat. 5° S. (1 degree = 69 miles).

3. Compare the areas of the two continents in millions of square miles. How many of the units of area (100,000 sq. miles) are there in each? (See Plate 1, and Fig. 58.)

4. How many times greater than the area of the British Isles is the area of Africa?

5. Write down names of three great towns about lat. 35° S., each in a different continent (See Plate 8.)

6. Mention three great river basins, and three big islands, cut by the equator.

7. Compare the position with regard to the equator of New Orleans and Cairo, Khartoum and Jamaica, London and Cape Horn, the Zambesi and the Parana, Panama and Aden, Cape Town and Gibraltar.

Surface Characteristics and Structure.

In the general arrangement of mountain and plain South America will be found to resemble North America but to offer many contrasts to Africa. Both the Americas have a great system of fold-mountains extending from north to south, roughly parallel to their western coasts; both have wide river plains in their centres; both have mountain blocks or ranges to the east. The Laurentian highlands correspond to the tablelands of Guiana and Southern Venezuela, the Appalachians to the mountains of Brazil. Africa, on the other hand, has no real mountain range except the Atlas, which is closely related with the Eurasian systems. Nearly the whole of the continent, south-east of a diagonal line from north-east to south-west cutting the continent into two halves, consists of a great tableland, descending in terraces to the sea. In

many places it is rifted and broken into rugged country, as in Abyssinia and Northern Natal; its monotony is sometimes relieved by such volcanic peaks as are found in the region of the Great Lakes, but, generally speaking, the narrow coast strip is bordered inland by the escarpments of the rocks that form the great central tableland, whose surface extends without great irregularities toward the interior.

North-west of the diagonal dividing line the Great Sahara takes up most of the area. It will be noticed that quite a high ridge of mountains extends from north-west to south-east across its centre. Only in parts is it a level desert. Hardly anywhere does its surface sink near sea-level. It resembles in many respects the interior of Western Australia.

B The two masses of high ground in Brazil and Guiana are each composed of a core of very ancient rocks, which are overlaid by newer sandstones, and in the south by coal-bearing strata. There has been very little disturbance since very early times, and therefore the more recent rocks lie generally in their original horizontal layers. Denudation has often been great, and rivers have cut out deep valleys, but the remaining high ground is generally of a characteristic flat-topped nature, similar to the table mountains so common in South Africa.

In several of these rock formations precious stones and minerals occur, and have become famous in both regions ever since the search for the mythical El Dorado of the sixteenth century.

The Central Lowlands are naturally divided into two regions :—

- (1) South of the Rio de la Plata, between the Andes and the Atlantic, are the two low plateaus of the Pampas region and Patagonia, of comparatively recent origin, covered over by glacial drift and blown sand, undisturbed by earth-folds, but in places pierced by basaltic flows.
- (2) The rest of the low-lying area consists of great river basins, much of which is covered by alluvial soil brought down from the surrounding mountains. Their soils are therefore naturally productive. The main streams have a remarkably slight slope, and inland navigation is therefore generally easy. The junction of the Marañon and Ucayali, for instance, although nearly 2,000 miles up the Amazon, is less than 400 feet above sea-level.

Between the Parana-Paraguay and the Andes there lies a more elevated region, the "Gran Chaco," which recalls the "Great Plains" of North America; and between this basin and that of the Amazon the "Mato Grosso" may be considered as a western and lower extension of the Brazilian tableland. The Andes, as far north as their narrow neck (about lat. 4° S.), consist generally of a double range, the older and more abrupt facing the Pacific, the newer and less steep looking east over the Central Lowlands. Between these two well-defined systems of folds are to be found many extensive plateaus, the most noticeable being in Bolivia, with an inland drainage of its own.

Toward the south, where glaciation has naturally been more active, the western range has been broken up into the fiords and islands of Southern Chile.

North of the dividing neck the chain becomes more complex, and finally spreads out into four branches, the western one extending to the Isthmus of Panama, the eastern forming the boundary of the Orinoco basin and curving out to sea as a partially submerged ridge, which can be traced in the Lesser Antilles, Porto Rico, Haiti, and Cuba.

The interior portions of the Andes are generally of very ancient rock, as is usual in such great folded systems. This is flanked by various uptilted and folded sedimentary rocks of various ages, and hence minerals of almost all kinds occur at different parts of the range, the silver of Peru, the gold and coal of Chile, being of value commercially.

Africa, as far as is known, is of comparatively simple geological formation. With the exception of the Atlas, which is a folded mountain chain of a similar age to the cretaceous rocks of Europe, the whole of the continent consists of an ancient mass of rock overlaid by beds of intermediate age—sandstones being the most characteristic—which have not suffered much disturbance. True mountain ranges are therefore almost entirely absent. The south-eastern half is largely an elevated tableland with flat-topped summits, except where there are volcanic intrusions. This usually extends almost to the coast, leaving narrow plains only between it and the sea. Its edges are usually higher than the interior, and therefore there is no decided watershed for rivers. Those which rise on the interior slope either have to break their way out, as the Congo, through unnavigable gorges, or do not get to the sea at all. Their value as a means of communication is thereby much lowered.

C Both continents are remarkably poor in islands. In Africa there are scarcely any of importance which stand upon the continental shelf. Madagascar is obviously quite separate, and has plants and animals of its own.

Toward the south of South America there are considerable remains of the continent now appearing in the form of islands. Even the Falklands are joined to the rather wide submerged plateau which extends to the east of Patagonia.

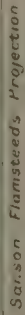
Volcanoes are, not unnaturally, common near the western border of South America, especially along the interior edges of the Bolivian Andes and in Ecuador. Much of the area of the central American States is also occupied by volcanic heights. These re-appear at intervals along the island chains of the West Indies.

In Africa volcanic energy has not had great effects. Near the west coast, the Canary and Cape Verde Islands, and the peak of the Camerons, are well known but isolated examples. Elsewhere the only noticeable instances are to be found along the remarkable rift valleys which extend southward from the Red Sea. The eastern rift is marked by Lake Rudolf and continues southward, its line being shown by the extinct craters of Kenia and Kilimanjaro. The western rift valley is occupied by Lakes Albert, Albert Edward and Tanganyika, and at its eastern border stands out the great

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Scale 1:50,000,000 (790 miles - 1 inch)

mountain mass of Ruwenzori, probably largely of volcanic origin. There are few examples of similar recent eruptive rocks so far away from the oceans. (See Plate 1.)

QUESTIONS AND EXERCISES.

- A** 1. What is the exact meaning of the various tints on land and sea?
2. Very little of Africa is under 600 feet; a great deal of South America. Is this true? If so, explain exactly where these low-lying regions are.
3. Write a list, with symbols, of the rivers, mountains, peaks, islands, parts of sea, lakes, and capes, which are marked in brown on the map of South America, and be ready to repeat from Test Map. On what principle are the symbols arranged?
4. Do the same for Africa.
5. What isthmus joins Africa to Asia? Where are the Pampas, Selvas, and Llanos? Name two deserts in Africa and a peninsula (marked in brown).
6. In a voyage right round Africa, starting from Gibraltar eastwards, what river mouths, capes and parts of sea would a vessel pass in order? (Only mention brown names.)
7. Repeat the above for South America, starting east from Isthmus of Panama.
8. What great river systems or lakes are crossed by the equator in each continent?
9. How do the following lie as regards the tropics:—Madagascar, the river Nile, the Niger, the Parana, Cape Agulhas, Aconcagua?
10. Write down to the nearest thousand feet, the heights of Aconcagua, Kilimanjaro, Highlands of Brazil and Abyssinia, and Ben Nevis. (From the diagram below maps.)
11. Name the great lakes of Africa. Say into what great river each is eventually drained, and into what seas.
12. Make a tracing of the outlines of these two continents from Plate 47. Fill in all parts of river courses which flow at a lower level than 600 feet. Which continent has the best system of inland navigation?
13. Make a tracing, in black ink, of the outline of Africa, from Plate 47, with the point where the equator is cut by longitude 20° E. near the centre of your sheet. Call this point X. On the same sheet trace, in red ink, the outline of South America from Plate 47, so that the point of intersection of latitude 20° S. with longitude 60° W. falls on the point X. Then on the same sheet trace, in blue ink, the outline of Asia from Plate 39, so that the point of intersection of latitude 40° with longitude 90° falls on the point X. These maps are all on the same scale, though not on similar projections. The comparative areas will be fairly accurate.
14. Compare these two continents, as to the shape of their coast lines, with Europe and North America. What results on climate and trade follow from such features?
15. Judging from Plate 1, which of these two continents has the larger area (1) over 600 feet, (2) over 12,000 feet, (3) under 600 feet?

- B** 1. Write a list, with symbols, of the rivers, mountains, peaks, islands, parts of sea, lakes and capes, which are marked in brown or blue, in the map of South America, and be ready to repeat from Test Map.
2. Do the same for Africa.
3. What latitude passes near the centre of the Kalahari Desert, Atacama Desert, Plateau of Bolivia, Galapagos Islands, Gran Chaco, and Mato Grosso?
4. Name a lake in South America and Africa from which there is no outlet, the two longest rivers in each continent, the highest peak in each, and the waterfall on the Congo.
5. Compare the rivers of South America and Africa as regards navigability.
6. Describe the geological structure of Africa. Why is there no coal in the Atlas region?
7. Into what natural divisions can South America be divided? Describe the structure of the various mountain groups.
8. Compare the Andes to the Rocky Mountain system, as to length, structure, and contained plateaus.
9. Compare the surface features of the two Americas, and Africa.
10. South America and Africa have few indentations. Com-

pare them, in this respect, with the other continents. How does this characteristic act upon their climate and trade?

11. Make a tracing, in black ink, of the outline of South America from Plate 52, and mark in all the parts of the river courses which are below the 600 feet contour. On the same sheet do the same for North America from Plate 41, all in red ink. Then superimpose a tracing of Africa from Plate 54, in blue ink, with the rivers treated in the same way. Compare the facilities for inland navigation of these continents. Why are the lakes of North America much more useful commercially than those of Africa? Which of the great rivers in these continents have deltas at their mouths?

- C** 1. Write a list, with symbols, of all rivers, mountains, peaks, islands, parts of sea, lakes and capes, marked in South America. Be ready to repeat from Test Map.
2. Do the same for Africa.
3. What is the difference in time between Valparaiso, Cape Town, C. Gardafui, and London?
4. Name an African peninsula in the Mediterranean, an oasis in the Sahara, an archipelago off Chile, any falls in African rivers.
5. Does the Congo look navigable from Stanley Pool to Stanley Falls? Does the Nile look navigable south of the junction of the Blue Nile?
6. Which rivers of Africa have deltas? Is the Congo one? How is navigation from the sea affected by the nature of their mouths?
7. Repeat from the Test Map all the mountains named in the diagrams below the map.
8. Compare the Sahara with the other great deserts of the world as to size and surface. Are similar causes at work in all the cases mentioned?
9. Trace the outlines of each of these continents, dividing off the various river basins by dotted lines. Shade in pencil the areas with inland drainage.
10. How many degrees, roughly, nearer the South Pole is Cape Horn than Cape Agulhas? How many degrees nearer the North Pole is Cape Blanco in Africa, than the extreme north of South America?
11. Do you consider that eventually Africa or South America will be of the greater use to mankind? Give reasons throughout.
12. If the whole of Africa were moved 30 degrees further north, what differences would you expect in its climate, supposing that its relative position in regard to oceans and other continents remained the same?

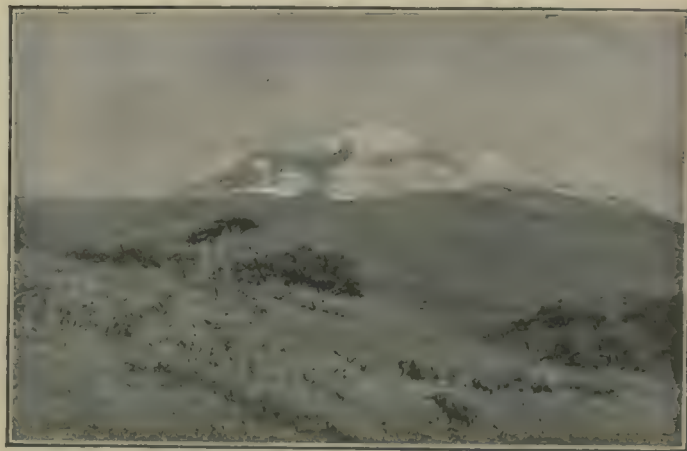


FIG. 149.—MOUNT KILIMANJARO.

View taken from S.W. of the summit, at the upper limit of tree-growth, between 9,000 and 10,000 feet. The dark trees in the centre are of the heath tribe. Notice the elephants, and the amount of snow visible. Glaciers are here found almost on the equator. How high is the summit? Give its latitude. In what country was the sketch made? The whole mass is the result of volcanic energy. Compare the height of this mountain with that of Mont Blanc and Ben Nevis. Allowing 1° for every 300 feet, give the approximate average temperature on the summit.

Comparative Temperatures.

A The next three pages of maps show how the climates of these two continents compare with each other, and the effect of rainfall and other conditions upon natural vegetation.

Throughout, the relation of the continents to the equator must not be forgotten. For instance, south of the equator January is the hottest month and corresponds to midsummer.

Isotherms and isobars are given, corrected to sea-level, or as they would be if the surface were perfectly flat. A rise of 300 feet makes about a degree of difference in heat; of 1,000 feet rather more than an inch in pressure. These differences in temperature are of great importance in considering the possibilities of European colonisation in tropical lands, but maps constructed on the principle here adopted are of greater value in determining the causes of prevailing winds and rainfall.

If a comparison is made between Africa and South America as to temperature, it will be at once seen that the former has far larger areas of great heat than the latter, and this for three reasons:—

- (1) Its greater size and width diminish the moderating influence of the oceans.
- (2) Its comparatively close connexion with Eurasia prevents any sea-influence from penetrating from the north-east.
- (3) Much more of its surface is within the tropics.

No area in Africa has an average for the winter month of less than 45°, whereas a considerable part of South America reaches far enough south to experience this.

The peculiar curves of the isotherms along the south-western coasts of these continents are caused by the influence of cold ocean-currents, which flow from the southern ocean. Their direction is described and accounted for in Part I. (See map on Plate 4.)

The variation in temperature at any given place in these continents between the January and July averages is never great, owing to the proximity of the equator or the sea. The greatest range is naturally to be found along that part of Africa outside the tropics which faces Eurasia. Why is this?

QUESTIONS AND EXERCISES.

- A** 1. During what month is the average temperature greatest in South Africa, Tierra del Fuego, the Nile delta, and Jamaica?
2. At what intervals of heat are the isotherms shown? What colours indicate comparative heat and coolness?
3. Account for the great heat over North Africa in July.
4. What is the cause of the northward curve of the Isotherms off the south-west coasts of Africa and South America?
5. Compare the temperature of the Cape of Good Hope and London in July and January.
6. What isotherms in these maps are crossed by lat. 30° S. and by the equator, in January and July? Write them in order from W to E.
7. What is the difference between the average temperatures of Cape Horn and Cuba in January and July, and between the extreme north and south points of Africa?
8. What is the difference between average July and January temperature at the mouth of the Nile, the Straits of Gibraltar,

the mouth of the Congo, the Cape of Good Hope, the mouth of the La Plata, the point on the east coast of South America where the tropic passes?

9. Why is it that the isotherms over the land areas of both continents south of the equator dip towards the south in January?

B 1. From the Isothermal maps of Europe (Plate 25) compare the July and January temperatures of Moscow, Cape Town, Brest, and Monte Video. Account for similarities or differences.

2. Why are the east coasts of both continents warmer than the west coasts, if compared at points on the same latitudes?

3. In a voyage from the south of Italy, via the Suez Canal to Cape Town, what isotherms would be passed by a steamer in January and July? Can you account for the great heat in the Red Sea in July?

4. During what month would the voyage from India be most comfortable?

5. Compare the temperatures experienced in Madagascar and Ireland in January and July.

C 1. The centre of equatorial Africa is hotter in January than in July. Can you account for this fact?

2. Why are there so few isotherms marked in the maps of South America north of the equator?

3. Would the area inside the 85° line in South America in January be actually hotter than the eastern margin of the similar area in South Africa if due allowance is made for elevation?

4. Why does the Red Sea have more influence upon the isotherms in July than in January?

Other Elements of Climate.

A The mere seasonal distribution of heat would be but a poor clue to the climate of any place, but it has such a great influence upon the other elements of climate, as indicated on Plate 50, that it is necessary to realise it first. On Plate 50 will be found the seasonal variations of the barometer, which control the prevailing winds, and so the rainfall. A reference to the general causes of high and low-pressure, as shown on page 15, will bring out the fact that the equatorial regions lie in a comparatively low-pressure belt, between the high-pressure areas on either side near the tropics. All these belts together move north and south according to the seasons. Between the high-pressure belts and the equator is the region of the trade winds. How far these pressure areas, and therefore the prevailing winds, are modified by the arrangement of land and sea and the distribution of temperature can well be seen by a comparison of these three pages of maps (Plates 47, 49, and 50).

Within the latitudes here dealt with, it can be noticed that during the winter month (that is, January if north of the equator, July if south) the comparative temperatures over land and sea have a tendency to follow the parallels of latitude, and therefore the interruptions of the high-pressure belts are less noticeable.

On the other hand, during the summer months the reverse is the case, as the land gets heated more quickly than the sea, and therefore the interruptions are much greater.

As a result, the trade winds are drawn more in to the interior of the continents during the summer season on either side of the equator, owing to the pressure being

* The difference gets gradually less as greater heights are reached. Thus the pressure at 30,000 feet is not 0.

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comparatively less inland, and therefore the rainfall at those periods is greater.

The great difference in climate between the east and west sides of continents is beautifully illustrated in these maps, especially in the southern half of South America, where the chain of the Andes accentuates the differences. Here, owing to ocean currents caused ultimately by the rotation of the earth from west to east, the western coast is colder than the eastern.

North of lat. 35° S. it receives very little rain, as the south-east trade winds have deposited their moisture before they cross the Andes, and any winds which may blow from the Pacific do not hold much water vapour, owing to the cold current along the coast. South of lat. 35° the west coast receives much rain and the east hardly any, owing to the fact that this is south of the high-pressure belt, and so in the region of the strong westerly winds. These naturally extend their influence farther north as the sun moves north in July, and therefore the rainy belt also extends along that coast. For the same reason, the extreme south-west corner of Africa gets rain in winter.

QUESTIONS AND EXERCISES.

1. In Plate 50, how are differences in pressure indicated? What part of an inch in pressure is there between each isobar marked? What is the highest pressure marked, and the lowest, on any of the four maps? For what periods do the isobars represent the average pressure?

2. What amount of rainfall do the various tints indicate, and for what periods?

3. What is the midsummer month at the Cape, in London, at Cape Horn, in Cuba?

4. In the lower map of Africa, why are the isobars regular in the south, irregular in the north? Account for the low pressure shown in the north-east corner.

5. At what season is the difference in pressure along the tropical high-pressure belts greatest as between land and sea? What influence does this have upon rainfall? Illustrate from South America.

6. Why does the Cape of Good Hope get rain in July and not in January, whereas on the south-east coast the opposite is the case?

7. Why is the north-east of Africa comparatively rainless?

8. Account for the fact that in lat. 30° S. the east coast of South America gets rain, while the west does not. Is there a similar set of conditions in South Africa, in similar latitudes?

9. In Africa and South America in January there is an area of comparatively low pressure south of the equator. Account for this, and explain what influence it has upon the rainfall.

10. Which rivers of Africa would you expect to carry much water, which little, comparatively?

11. Why does the Nile receive no tributaries north of the Atbara?

B The tendency for winds to rotate round areas of high pressure must not be forgotten. South of the equator the movement is in the opposite direction to that of the hands of a clock, a tendency well illustrated in the Southern Pacific and Southern Atlantic, especially in January. This accentuates the dryness off the south-west coast of Africa and of South America within the same latitudes.

The great similarity in the distribution of rainfall over the southern halves of these continents, where the surroundings are similar, is noteworthy. The difference caused by the nearness of Eurasia to Africa is also remarkable, but quite as would be expected.

The peculiar dry patch to the north of South America in the upper map can be partially explained by a reference to the Temperature Map. At that time the comparatively cool and heavy air over the land repels the trade winds, in just the same way that the Somali peninsula seems to push off the moisture-bearing winds from the Arabian Sea.

QUESTIONS AND EXERCISES.

1. What is meant by cyclonic and anticyclonic areas? (See pages 16 and 17.) In what way do the winds rotate in these, north and south of the equator? Illustrate from these maps.

2. Account fully for the existence of the Atacama desert, and the rainless region of South-west Africa.

3. Along the equator there is generally a rainy belt at all seasons. There are one or two exceptions in this map. Can you account for them?

4. The trade winds do not as a rule bring so much rainfall as the prevailing south-westerly winds in the northern hemisphere. Why is this?

5. Trace the outlines of these four maps in the same relative positions as on Plate 50. Mark in all the isobars. Shade in with crossed lines in ink all the areas with pressure over 30.2 inches, with diagonal ink lines the areas between 30 and 30.2, with diagonal pencil lines the areas between 29.8 and 30, and leave white the areas below 29.8.

6. What is the influence of ocean currents along the south-west coast of South America on pressure and rainfall? Is there a similar set of conditions in South-west Africa?

7. Account for the lack of rain in Somaliland and the extreme north of South America, in the upper two maps.

8. Between what dates does the Nile basin receive most water? At Cairo, high Nile is in September, low Nile in April. Account for this.

9. Give the period of high water in the rivers Orange, Zambesi, Niger, and Parana.

C The influence of convectional rains near the equator is well seen in these maps. The area of greatest rainfall over both continents is greatest just south of the equator in the top two maps, just north of it in the lower two, as would be expected, according to the position of the sun at the different seasons.

The data for the construction of these maps are naturally not very complete. Therefore scientific exactness cannot be expected. However, a general approximation to the truth has been attained. It is interesting to notice how the feeders of all the great rivers come from the rainy regions.

QUESTIONS AND EXERCISES.

1. Why is the rainfall over the West Indies and Central America greater in the lower map than the upper?

2. Account for the distribution of rainfall over Madagascar at various seasons.

3. In what parts of these continents do convectional rains have most influence? At what season, and why?

4. Why is it impossible to get full data upon which to construct these maps?

5. Would you expect to find the climatic conditions in Australia as a whole the same as those of South Africa south of lat. 10° S.? If so, why?

6. Compare the climatic conditions in the basins of the Congo and Amazon.

7. Compare the direction of the tributaries of the great rivers of these continents, and account for it in each case.

Vegetation and Population.

A Natural vegetation must depend upon the distribution of heat and moisture and a dense population generally is found where it is easy to grow vegetable food. In these continents such causes and effects are very manifest. The artificial influences of civilisation have not made any large exceptions to the natural distribution of human beings.

The areas which have little natural rainfall, especially in these hot continents, are usually deserts. They are interrupted by oases, which nearly always occur in depressions, where the scanty rainfall generally collects and forms springs or wells.



FIG. 150.—IN THE LIBYAN DESERT.

The result of heat without moisture. Blown sand covers everything, and wears away the rocks. A desert is not often level. Notice the feet of the camels. They are helpless on a muddy surface. These Mohammedans are looking towards Mecca to pray. In what direction are they looking; east or west? Is the time of day before or after noon? Contrast the methods of prayer used by Mohammedans and Christians; notice the headgear and shoes.

Along the Nile valley the extensive irrigation works make Egypt one of the richest agricultural countries in the world, and hence there is a heavy population along the river valley. Wherever water can be made to flow perennially on to the land, almost every kind of crop can be grown. There is practically no idle season. The land which bears sugar or rice in the hot season produces wheat or other grain in the cooler winter months.

The desert of South-west Africa has little population except where copper is found, as indicated in the map. The Atacama desert in South America has rich supplies of nitrate, a natural salt which remains in the ground where there is no rainfall to wash it out, and hence is partially populated.

In Africa, most of the cultivable and partially cultivable land is occupied by a fairly dense native population; even the great tropical forests of the Congo are not deserted. In South America, on the other hand, large tracts of the Amazon basin are not inhabited, owing to the peculiar conditions. The surface is very level and low-lying and the rainfall is immense, so that the country is usually flooded. Huge forest trees grow with their roots submerged for much of the year; these are again



FIG. 151.—ON THE SLOPES OF KILIMANJARO.

As the higher ground is reached, the dry African steppe gives way to a great zone of dripping forest, caused by the condensation of vapour against the more elevated regions. The above sketch was made near the upper limit of trees (at about 9,000 feet). Most of the vegetation here seen is of the heath tribe, which is able to resist great extremes of temperature. The peculiar tree-like plant in the foreground is matched by a similar species found in the tropical Andes.



FIG. 152.—AN EAST AFRICAN STEPPE.

A common type of scenery wherever the rainfall is insufficient to support a forest growth. Heavy dews at night keep enough grass for numerous wild animals. Notice the antelope, zebras, giraffes, and ostriches in the picture. Such trees as are found are all adapted to resist great evaporation, and have few leaves, and hard bark. The large tree in the foreground is a baobab. How does it differ in appearance from a normal tree?

covered with creepers and parasitic plants, all struggling upward to the light, so that it is impossible for permanent human abodes to exist.

The other region of little population in the south is capable of producing cattle and sheep, and may one day be the home of numerous ranching settlers.

The countries between the Atlas Mountains and the sea enjoy conditions naturally favourable to life, and have from early times been peopled by invading nations.

The intense population of the Niger delta is partially to be explained by historical reasons, but is chiefly due to the fact that, though there is plenty of rainfall, it is just outside the equatorial belt of almost perpetual downpour, and therefore has a comparatively cool and dry season, corresponding to our winter and spring, which is favourable to human life in those latitudes.

B Most of the high ground in the Andean system is capable of bearing a moderate population, owing to the existence of many fertile river valleys. The elevation is favourable, as long as it is within the tropics. Of course, the highest parts of the range cannot be inhabited, but these regions are too limited to indicate in the map, except in the southern part of the Bolivian plateau.

The upper valley of the Magdalena is a good example of a well-peopled upland district within the tropics. This was originally, no doubt, caused largely by the existence of plentiful mineral wealth.

South America is, as a whole, perhaps the least developed of any continent. There is not even a large native population in the interior, as in Africa, and therefore it is only where some special attractions exist that the interior districts of South America have been even partially peopled.

Races of People.

In South America there are three main divisions in the inhabitants :—

- (1) The Aborigines, a yellowish-brown race, chiefly found in the interior and forest regions. They are not numerous in their pure state. The Incas of Peru were their most famous representatives.
- (2) The European races, made up of the descendants of the Spanish and Portuguese invaders, and of the more recent settlers. British are fairly numerous in Argentina, Chile, and the West Indies; Italians, Frenchmen and Germans in the La Plata basin and elsewhere.
- (3) The African negroes, descendants of the slaves introduced by the Portuguese, and chiefly found along the east and north coasts, from the La Plata to the Isthmus.

Africa, north of lat. 10° N., is mainly peopled by races of Caucasian origin, the most famous being the ancient Egyptians, whose descendants are the chief cultivators of the Nile valley, and the various branches of the conquering Moslems from Arabia, who have spread their religion and influence right across to the west coast.

South of lat. 10° N. the arid regions cease, and from east to west extends a broad equatorial forest zone peopled by typical negroes, the Sudanese. South of the equator another and generally lighter-skinned type of negro predominates, the "Bantu," whose best known members are the Kaffirs. European nations have sent settlers to the most promising parts of the continent, but only the extreme north and south, and possibly the highlands of the eastern tropical region, are climatically suited to such inhabitants. The French in Algeria, the British and Dutch in South Africa, are by far the most important of this group, but are numerically an insignificant fraction of the total population.

C Of the aboriginal inhabitants of South America, those dwelling in the Andean region had reached a fairly high state of civilisation when the Spaniards conquered their country. In the north, these



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FIG. 153.—IN THE ALGERIAN SAHARA.

Taken during a dust storm, near Biskra, on the occasion of a race meeting organised by the French garrison. Notice the Moorish dress, and the kind of vegetation. This is on the edge of the desert, in the land of dates. Locate the place on the map, and give its latitude. Does a railway go to Biskra?



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[Underwood & Underwood, London and New York.

FIG. 154.—TYPES OF AFRICAN RACES.

These men live in the deserts of Egypt. They are typical nomads. Notice their tent, their clothing, and long rifles. Most of the faces in the picture are like the Jewish type. Of what race are these? In the right lower corner is a man of the Sudanese negro type. Contrast his features with those of the rest. Compare the dress here shown with the clothing of the Berbers in the picture above.

interesting races had spread to Central America and Mexico, where their descendants are still numerous. In the south, the Araucanians of Chile made a strong resistance to Spain, and still form an appreciable element in the population. The natives of the great river valleys of Patagonia and Tierra del Fuego have always remained in a lower state of development, but have not by any means died out.

Throughout the continent, a great mixture of white, and black, and brown races has taken place, and the result is that the majority of the inhabitants in this region are unable to be assigned definitely to any one predominant type.

In North Africa, the Caucasian races can be divided into the Hamites and Semites. The former were much the earlier to invade the country, and besides the Egyptians, the Berbers of the north-west, the Tuaregs of the Sahara, the Gallas of Abyssinia, the Somalis and Masai of East Africa, are among their representatives. Of the latter, the Arabs of the Upper Nile and the Fulas of Northern Nigeria have shown their power in recent times. Abyssinia was peopled by an invasion from Arabia long before the rise of Mohammedanism, and still retains a form of the Christianity which was introduced there in early times.

Besides the many Bantu races of the southern half of the continent, are to be found Hottentots and Bushmen in the arid regions of the south-west, the Pygmies of the Congo forest, and the Hovas of eastern Madagascar, the latter of quite distinct Malayan origin.



FIG. 155.—DISTRIBUTION OF AFRICAN RACES.

QUESTIONS AND EXERCISES.

- A**
1. What parts of Africa are desert, and why? Are these areas entirely destitute of vegetation or inhabitants? Why not?
 2. In what parts of these two continents are areas marked as too high for useful vegetation?

3. Where are the most important producing regions for wheat, rubber, vegetable-oils, coffee, sugar, cocoa?

4. Pine-forests are not common in these continents. Why not? What kind of tree growth is chiefly found?

5. What regions, though rainless, are productive, and why?

6. Why is the population of Africa greater than that of South America?

7. Compare the Congo basin and the Amazon basin as to climate, rainfall, natural vegetation and population.

8. Bring up two traced outlines of each continent (on a scale of 1:80,000,000), and be ready in class to fill them in as vegetation and population maps.

9. Compare the population of South America (39,000,000) with that of U.S.A., the United Kingdom and the Indian Empire. (See Figs. 93 and 168.)

B

1. Mention the main groups into which the races of Africa can be divided. How are these distributed geographically?

2. Do the same for South America and Central America.

3. Where are Europeans chiefly found in these two continents? What are the climatic causes?

4. Compare the Argentine and British South Africa as to climate, rainfall, natural products and distribution of population. Are the same natural causes at work in both regions?

5. About lat. 34° S. there are very similar patches of population on the east and west coasts of both continents. Can this resemblance be accounted for?

6. Do similar causes bring about the Atacama desert and the desert of South-west Africa? Why is the latter the larger? What mineral products induce people to live in these regions?

7. What influence has the position of Eurasia upon the climate, rainfall and vegetation of Northern Africa? Compare the conditions in the north of South America, and give reasons for the differences.

8. Compare the thinly populated areas of South America and Africa. Are there similar causes at work? Are any parts of these regions likely to be peopled in the future, and why?

9. Compare the conditions of climate, rainfall, and natural products in lat. 30° S. on the west coasts of South America and South Africa? What natural features cause the great difference?

10. Trace the Vegetation Map of Africa, shading in pencil all the areas marked in any shade of blue. Make diagonal lines in ink over the forest regions. Place this over the Climatic and Population maps, and be ready to show the natural connexion between these maps?

C

1. Arabs are nomadic, negroes agricultural. Have these characteristics influenced the distribution of the two races in Africa, or have the natural conditions brought about these characteristics?

2. The deltas of the Nile and the Mississippi are in about the same latitude. Compare and contrast their climates and natural productions. Explain why they differ? Why is it that the amount of water carried by these rivers is so very dissimilar both in amount and seasonal variation?

3. To what extent, do you think, does the elevation of the surface in certain parts of tropical Africa and America make possible permanent European settlements?

4. Make a tracing of the outline of Africa from the map on Plate 51. Be ready to fill it up from memory as a map showing the distribution of races.

5. Do you expect a greater future for South America south of the tropics or for South Africa south of the tropics? Compare their relative advantages of position, climate, and surface features.

6. Give an account of the races of South America. What native races still survive, and where? What would you expect to be the dominant languages and religion of South America?

7. Get a reference atlas, and from it find where are to be found the greatest proportion of Portuguese and Spanish names in these continents. Give examples of native names in both continents, and of Arabic names in Africa.



Central and South America.

Geographical Dates.

| A | B | C |
|--|---|---|
| 1492. Discovery of the West Indies by Columbus. | | |
| 1500-1600. Conquest and colonisation of Mexico, West Indies, and S. America by Spain; of Brazil by Portugal. | 1519-1535. Cortez in Mexico.
1531-1541. Pizarro in Peru. | |
| | 1655. Jamaica taken by British. | 1620 onwards. British, French, Dutch, & Danish settlements in the W. Indies, Guiana. |
| | 1797. Trinidad taken by British. | |
| 1810-1825. Revolt of Spanish and Portuguese America. | 1815. British Guiana finally ceded by Dutch. | 1811-1831. Public career of Bolivar, the liberator of S. America.
1822. Dom Pedro made Emperor of Brazil.
1889. Brazilian Republic. |
| 1898. War between Spain and U.S.A. Cuba and Porto Rico lost to Spain. | | |

A The history of South America, in its general outlines has been comparatively simple. The influence of historical causes upon political boundaries, language, religion, architecture and social customs is easy to trace.

Its discovery, conquest and colonisation are alike chiefly the work of Spain and Portugal. Central America, Mexico and the West Indies may be included in the area thus treated.

For three hundred years Spain practically was the master of the continent, with the exception of the Portuguese portion of Eastern Brazil, and a few other European settlements in Guiana. After the Napoleonic wars, and as a direct consequence of them, the movement for independence became strong. All Spanish America except Cuba and Porto Rico broke away by violent means. Brazil effected a peaceable separation from Portugal about the same time.

As a result we find the various republics of South America, whose boundaries inland are still in many cases undecided.

In consequence of the war with the United States in 1898, Spain lost all her colonial possessions. Cuba has now become an independent republic, closely connected with the States, which have reserved certain rights; and Porto Rico which was ceded after the war, now stands in the relation of a self-governing colonial possession.

B While Cortez and Pizarro were busy in their brilliant but cruel conquests in Mexico and Peru, other Spanish leaders were gradually introducing Spanish power in the West Indies and Central America.

Jamaica, after being colonised by Spain about 1500, was taken by a British expedition sent out by Oliver Cromwell. Trinidad has had a somewhat similar history.

C The Portuguese gradually occupied Brazil in much the same way as the British gained India—by a system of protected trading stations. They too had to face a keen rivalry from the French, who did not finally leave Brazil until 1615. The Dutch also made a bid for power, and took Bahia in about 1600, and were not forced to leave till more than fifty years afterwards.

During the Peninsular War, the Portuguese Court was transferred to Rio de Janeiro. Soon after Brazil became an independent Empire, a form of government which lasted until 1889, when the Republic was created on the model of the United States.

The most remarkable figure in the struggle for freedom from Spain was the Colombian general, Bolivar. After his victories he succeeded in uniting the northern part of the continent into the great republic of Colombia (about 1825). A few years afterwards, however, a separation took place, which brought into existence as independent republics the modern states of Venezuela, Ecuador, and Colombia.

Bolivia, named after the great liberator, Peru, and Chile, also became finally free of Spanish dominion at about the same date.

In the West Indies and the north-eastern coast of South America, the British, French and Dutch for two hundred years (1620-1820) struggled for territory. What is now Dutch Guiana was originally colonised by the British, and the modern British Guiana was first a Dutch settlement.

France, between 1700 and 1800, made Hispaniola a flourishing island. The negro republics of Haiti and San Domingo were formed in that island soon after 1800, as a result of a premature freedom granted to the slaves at the time of the French Revolution.



From "Trade and Travel in South America," by F. Alcock.

FIG. 156.—SANTIAGO (CHILE).

The square and public gardens. What mountains are seen in the background? Give the latitude. The town is about 1,800 feet above sea-level. Judging from the July isotherms, would you expect frost here in winter? The buildings are made low because of earthquakes. Look at the rainfall maps and explain why December is a drier month than June in Santiago.

Industries, Communications and Trade.

A When it is remembered that the entire population of South America is only about 39,000,000 and that the great bulk of the continent is within the tropics, it is only natural to expect a comparatively small industrial development. The map shows that certain valuable minerals are well distributed, and also that they are worked. The absence of coal prevents deposits of iron-ore from being dealt with, as it will not bear the cost of transport. The gold of Brazil and British Guiana is worthy of mention, but its value is small compared to the total world production. Bolivian silver was at one time very important, and even now over one million pounds worth is annually produced.

Copper is found in many parts of the Andean system, and is exported on a large scale from Chile. This state, which is perhaps the most advanced in manufacture of all South American states, is the most important producer in the world of nitrate of soda, a natural salt found in the dry desert strip, used both as a chemical manure and in the manufacture of sulphuric acid.

The remaining industries of South America are chiefly connected with the raising and preparing of vegetable and animal products.

Within the tropics, cocoa, coffee, sugar and tobacco are leading crops for export. Rubber from the Amazon valley is of great value. In the more temperate south, the breeding of cattle and sheep is carried on with success, and the Argentine Republic takes a high place in the world as a producer of wool and meat and hides. Chile has a share in similar trades. From this region also enormous quantities of wheat have been exported to Europe, and Argentina rivals Russia, North America and India as a surplus producer of this grain.

The railway development of the Argentine Republic is a proof of its great commercial prosperity. Most of the railways of South America have been shown on the map. In the tropical parts it will be noticed that the lines are usually comparatively short, as they serve as connecting links between some fertile elevated region not far inland and the coast. A rather lengthy railway was necessary to put Bolivia into communication with an ocean port.

For the most part the rivers of South America are navigable, as would be expected from the general surface characteristics. Far the greatest volume of trade is carried on along the rivers which run into the Rio de la Plata. Steamers run up the Amazon for about 3,000 miles, and much of the Orinoco and Magdalena rivers is made use of in the same way.

So far, the only railway connexion from the Atlantic to the Pacific is across the Isthmus of Panama. The line from Valparaiso to Buenos Ayres, though represented as finished in the map, has still to be completed across the pass over the Andes, where a tunnel three miles long is being constructed at a height of 10,000 feet.

The railways in Peru are even higher, and it is possible in a single day to travel from the tropical coast through all varieties of climate up to the snows of the Andes at a height of more than 15,000 feet.

The Panama Canal will probably be finished in about 1915, and will allow the largest ocean steamers to cross from sea to sea.

All the ports of South America, and the West Indies are well served by steamers, as can be seen from the map, where the most important routes are indicated.

B Among less important industries may be mentioned the cotton growing of Eastern Brazil, the gathering of Peruvian bark (or cinchona) for the manufacture of quinine, in Peru and Colombia, and the raising of pitch from the natural pitch lake of Trinidad, whence is made much of the asphalt to be seen in this country.

The West Indies have developed a considerable trade in tropical fruits to the United States and Great Britain, bananas, oranges, and pine-apples being the most valuable.

C The peculiar animals of Peru, the llama and vicuna, yield the "Alpaca wool" of commerce. British Honduras is famous as a producer of valuable tropical woods, mahogany being the best known. The diamonds of Brazil have long been famous, but are of little value compared to the product of the Kimberley mines in South Africa.

QUESTIONS AND EXERCISES.

A 1. Write a list, with symbols, of all the states of Central and South America, giving the names of any towns (marked in brown) in each. Be ready to repeat from the Test Map.

2. Write a list, with symbols, of all islands (marked in brown), and add to what country each belongs, and any towns in them which are mentioned in brown. Be ready to repeat from Test Map.

3. What are the chief ports of South America? Mention in what country each is.

4. From what countries or islands are there exports of animal products, wheat, maize, coffee, cocoa, rubber, sugar, wool, raw cotton, copper, nitrate, bananas, mahogany, tobacco?

5. To what ports or islands is there direct steamer communication from Southampton, Liverpool, Havre, Honolulu, San Francisco, New York?

6. In a voyage by sea from Southampton to San Francisco, what ports in South America would be touched at in order?

7. Account for the absence of railways in the Amazon valley and their great development in Argentina.

8. What countries produce gold, silver, copper, and coal?

9. Judging from the map, what two states of South America have a navy? What are their naval ports?

10. By what two rivers can the products of Bolivia reach the sea? Can the sea be reached also by rail?

11. What are the three most populous states and the five most populous towns, marked on the map?

B 1. Write a list, with symbols, of all the countries of Central and South America, adding the chief towns (in blue or brown) in each. Be ready to repeat from Test Map.

2. Write a list, with symbols, of all islands (marked in brown or blue), saying to what countries they belong, and adding chief towns (in brown or blue) in each.

3. What rivers have part of their courses in Brazil, Argentina, Bolivia, Peru, Venezuela?

4. What parts of South America will be especially helped by the Panama Canal?

5. What ports do a large trade in nitrate, bananas, rubber, cattle products?

6. What states are cut by the tropic, by the equator?

7. How do you account for the importance of Rosario, Iquique, Guayaquil, Rio de Janeiro?

CENTRAL & SOUTH AMERICA.—Political.

52







From "Trade and Travel in South America," by F. Alcock.

FIG. 157.—VALPARAISO.

Give its latitude. With what town is this connected by rail? In what kinds of trade would you expect these numerous merchant vessels to be engaged? Notice the large sailing vessels, which still carry on trade via Cape Horn with Great Britain.

- C**
1. Write a list, with symbols, in order, of all the towns on Plate 52, grouping them according to countries. Be ready to repeat from Test Map.
 2. Write a list, with symbols, of all islands, saying to what countries they belong.
 3. What is the ocean port of La Paz, Ouro Preto, Caracas, Valencia, Bogota, Lima, Santiago, and Quito?
 4. What ports would a coasting steamer be likely to touch at, in order, along the west coast, from Panama to Cape Horn?
 5. From what places are there steamer routes marked converging on the Isthmus of Panama?



From "Trade and Travel in South America," by F. Alcock.

FIG. 159.—OLD SPANISH BUILDING AT AREQUIPA.

This town is in about latitude 16° S. and longitude 71° W. In what country is it? This beautiful doorway, which recalls both Greek and Moorish architecture, has resisted the numerous earthquake shocks of the last three hundred years.



From "Trade and Travel in South America," by F. Alcock.

FIG. 158.—THE HARBOUR AT PERNAMBUCO.

Give the latitude and longitude. Notice the coral reef which protects the harbour. This runs for hundreds of miles along the coast. At this point there is an opening which allows quite large steamers, such as are seen in the picture, to enter. Very big liners have to remain outside.

Africa.

Geographical Dates.

| A | B | C |
|--|--|--|
| 2500 B.C.-600 A.D.
Early civilisations in North Africa and the Nile valley. | 2500 B.C. Beginning of Egyptian history. | |
| | 1100 B.C.-200 B.C. Phœnician influence in N. Africa. | 600 B.C.-600 A.D. Greek influence in Egypt. |
| | 200 B.C.-400 A.D. Roman power in North Africa. | |
| 640-1400 A.D.
Gradual spread of Arab and Mohammedan influence in Africa, as far as the Niger, and down the east coast. | | 640-700. Arab conquest of North Africa. |
| 1415-1580. Portuguese exploration and colonisation, chiefly round the coasts. | 1493. Bartholomew Diaz rounds the Cape. | 1497. Vasco da Gama sails round the Cape and up the east coast. |
| 1560 onwards. Trading (largely slave dealing) companies from England, Holland, and France, in West and South Africa. | 1652. Dutch at the Cape. | |
| | 1795. Capture of the Cape by England. | 1662-1684. Tangier belonged to England. |
| | 1832. Descent of Niger by the Brothers Lander. | 1807. Slave-trade made illegal by England, 1815, by most European Powers. |
| 1800-1890. Exploration of the interior. | 1858. Discovery of Victoria Nyanza by Speke. | 1850-5. Barth's travels across Sahara. |
| | 1849-1873. Livingstone's journeys in the Zambesi basin and Upper Congo. | 1869. Suez Canal finished. |
| | 1885. Berlin Conference. | 1877. Stanley proved the course of the Congo. |
| | 1890. Brussels Conference. Modern boundaries determined. | 1898. Anglo-Egyptian re-conquest of the Sudan. |
| 1901. Transvaal and Orange Free State conquered by British. | | |

navigators carried out their great discoveries. In tropical Africa, Portugal worked on very similar lines to those adopted in Brazil. Plantations and minerals worked by slaves, and the slave trade itself, were looked upon as legitimate sources of income. Just as in South and Central America and in India, the other great colonising nations of those times, the British, French and Dutch soon began to compete in such trades. Hence came the beginnings of French West Africa, and of the influence of Holland and Great Britain in the south.

From about 1800 a new era may be said to have commenced. Exploration, at first scientific, soon took a political turn. The vast interior, gradually unveiled by the heroic efforts of a score of great travellers, became a bone of contention between the Powers of Europe. Wherever traders flourished they claimed the protection of their country's flag, and the danger of international conflicts became so great that some sort of a partition became necessary. In 1885 the Berlin Conference was the means of provisionally settling the boundaries of various European spheres of influence upon the map. The imperfect geographical knowledge of the day prevented finality. The Boer War has brought within measurable distance a federated British South Africa.

B The Dutch Settlement at the Cape was made as a convenient resting-place for ships on their voyage to the very important possessions in Java and the Dutch East Indies. Only gradually did the intrinsic value of that region become manifest. The discovery of the rich gold deposits of the Transvaal in about 1885 has assured the commercial development of the whole.

During the century of exploration, the problem of the interior drainage was perhaps the most striking. Since the dawn of history the nature of the source of the Nile had been an object of speculation. The Royal Geographical Society, by sending out the expeditions under Speke and Burton in 1857, and under Speke and Grant in 1859, was the means of clearing up a mystery which had defied all previous efforts for more than 3,000 years.

The Congo and Niger and Zambesi also presented difficult problems, and maps of Africa constructed during the middle of last century show the Niger entering the sea by the Congo mouth, while the existence of the great river system of the latter is scarcely hinted at. The upper Niger was investigated from the north long before its difficult lower course was known. Its mouth is disguised amid a tangled delta, where at least twenty-five creek-like openings do not suggest the existence of a great river. The Congo mouth, on the other hand, cannot be missed from the sea.

British explorers at length succeeded in descending from the upper courses of these rivers to the sea; while Livingstone, the great missionary through whose efforts the horrors of the slave-trade were made known to Europe, gradually made clear the river system of the Zambesi. He was the first white man to look at the wonderful Victoria Falls, whose gorge is now spanned by a railway bridge.

The Brussels Conference of 1890 decided on measures, which have proved successful in almost entirely putting down commerce in slaves, and at the same time tacitly

A With the exception of the northern portion of Africa, and of some of the east coast, which regions have been closely connected with European and Asiatic history, African historical geography hardly begins until about 1500, when the Portuguese

acknowledged boundaries to international spheres of influence, which have not since been very largely modified.

C The opening of the Suez Canal in 1869 was the beginning of a series of events which led to the political partition of Africa. Egypt at once became a country of enormous importance. The struggle between England and France for the paramount influence there was really settled by the refusal of the French to interfere after the rebellion of Arabi in 1882. The final suppression of Mahdism in the upper Nile by British and Egyptian troops at the battle of Omdurman in 1898 made Great Britain practically the ruler of the main valley of the Nile from Victoria Nyanza to the sea.

Industries, Communications and Trade.

A Africa, even more than South America, suffers from an excess of heat, and therefore has not been at all fully developed by Europeans except in the extreme north and south. Want of rain makes much of the northern part useless for human industry, while excess of it is almost as fatal to development in the tropical forests of the west and centre.

Coal is found only in British South Africa, and so manufactures are not highly developed. The gold of the Transvaal and the diamonds of the Kimberley district are of enormous comparative value. Other supplies of gold from Abyssinia, the Gold Coast, and the Egyptian Sudan are, as yet, not important. With these exceptions, agriculture and the raising of cattle and sheep are almost the only industries throughout the continent.

The Mediterranean strip and South Africa, south of the tropic, can be divided off from the tropical centre.

Algeria and Tunis, well governed by France, have similar products to those of the Iberian peninsula, wine and wheat being their leading articles of export.

The olive oil of Tunis, and the wool and alfa or esparto grass of Central Algeria may be mentioned as valuable special products. The latter is exported largely to Great Britain for paper-making.

Morocco may become of equal value to Algeria if ever it receives settled government. Now it is a fanatical Mohammedan State.

Egypt enjoys such exceptional conditions that it is specially treated further on. South Africa, outside the tropics, is almost entirely British, and is, therefore, dealt with in Part VI. Its chief export (besides gold and diamonds) is wool, which indicates the leading industry of the country. Wheat and maize are also extensively raised.

Of tropical Africa it may be said that most of the inhabitants are simply content to raise enough for their own support. The collection of rubber, ivory, and various oil-producing seeds (such as palm-nuts) occupies a certain number and provides the chief articles of export.

Means of communication in Africa are of necessity not much developed, except in Algeria, Egypt, and British South Africa, where railways and roads are fairly numerous. Elsewhere the rivers are still the chief means

of transport. Owing to the plateau formation of the continent, many of these are obstructed by rapids near their mouths as they descend from the elevated interior; for example, the Congo. The rapids have now been overcome by means of a railway, and above Leopoldville there stretches 1,000 miles of fine waterway open to steamers.

The Zambesi and the Niger both have deltas difficult to navigate. Even when the main stream of the Zambesi has been reached, steamers can only ascend for about 200 miles before impassable rapids are met with.

The Niger can be ascended by steamers to a little above its confluence with the Benue: this great tributary adds another 600 miles of navigable waterway. The upper Niger again becomes navigable. Hence the importance of French railways joining it to the west coast.

The Nile has a difficult delta, but from Cairo to the first cataract at Assuan is easy for steamers. It has many stretches of open waterway between the cataracts, and steamers can travel from Khartoum as far south as the borders of the Congo State.

By means of railways many of the unnavigable parts of African rivers have been circumvented and easy communication opened with the interior.

The Uganda railway has made the navigation of Victoria Nyanza of importance, and provides the quickest route to the equatorial region. In South Africa, where there are practically no navigable rivers, railways have been well developed by the British, in Algeria by the French.

B In tropical Africa many attempts have recently been made to grow cotton, especially along the Blue Nile and near Lagos. Some of Rhodesia is also probably suited for this crop. Success will no doubt reward these attempts in the future, as there is no reason, owing to climate or soil, which can prove fatal. Egyptian cotton is already of enormous value.

Cocoa and coffee may become leading products later on.

The dates of Southern Algeria and the ostrich feathers of Cape Colony, are valuable articles of export.



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FIG. 160.—CONSTANTINE.

Under the name of Cirta, this was the capital of the Numidian kings, famous in Roman history. It was rebuilt by the Emperor Constantine. What other city owes its name to the same builder? Who are the present rulers of Algeria. Notice the peculiar gorge, and the rock formation of this natural fortress. Locate the place. Can it be reached by rail?



Fig. 161.—STREET SCENE IN TANGIER.

Locate the town in the map. Give its latitude and longitude. What advantages does its position give? What do you know of its history? Notice the gateway through the old town-wall, the costumes, the building on the left with fine Moorish doorway: the outside windows are few and strongly barred; in nearly all houses exposed to attack, the windows open into an enclosed courtyard. Dogs and vultures are the most efficient street scavengers.

QUESTIONS AND EXERCISES.

(Include the Inset Map.)

- A** 1. Write a list, with symbols, of the various political divisions of Africa (named in brown), saying to which country each belongs. Be ready to repeat from Test Map.
- [Egypt and Tunis are nominally Turkish, though practically controlled by Great Britain and France respectively. Morocco, Liberia and Abyssinia are the only independent states.]
2. Write a list, with symbols, of all the towns in brown, saying in which political division each is. Be ready to repeat from Test Map.
3. What countries of Africa are wholly or partially outside the tropics?
4. Write a list, with symbols, of the five islands or groups of islands off the African coast, named in brown. Say which European country controls each.
5. In a journey from Durban to Cape Town by rail, what countries and towns would a traveller pass in order?
6. Which are the seven ports specially marked? What exports come from each?
7. Which of the towns marked in brown have railway communication?
8. Follow the steamer routes from Cape Town to the Bay of Biscay by west and east coast, and write down what important places (towns, islands, or countries) would be passed. (Mention those in brown only.)
9. What are the main routes leading to the interior? How far have railways been made to supplement the rivers?
10. Do you judge the following states to be greater than, about equal to, or less than the unit of area (as shown in north-west corner of the map): Liberia, Nigeria, Transvaal, Tunis, Natal, Cape Colony?

- B** 1. Write a list, with symbols, of all political divisions and islands, named in brown or blue, and say to which country each belongs. Be ready to repeat from the Test Map.
2. Write a list, with symbols, of all towns marked in blue or brown, and say in what division or island each is. Be ready to repeat from Test Map.
3. Near what towns on the Nile are the three Barrages, the Pyramids, and the ruins of Memphis and Thebes?
4. Write a list of all the ports (in blue or brown) which have steamer routes marked as going to them.
5. In what parts of Africa are gold, coal, and diamonds mentioned on the map?
6. Account for the importance of Lourenço Marquez, Mombasa, St. Louis, Assuan, Kumasi and East London.
- C** 1. Write a list, with symbols, of all political divisions and islands, adding to what country each belongs. Be ready to repeat from Test Map.
2. Do the same for all towns, grouping them by their political divisions.
3. What naval stations are mentioned? To what European nation does each belong?
4. Mention any towns on or near the Niger, Zambesi, and Blue Nile.
5. What nations have possessions near the strait of Bab-el-Mandeb? Name them.
6. Why is Cape Town of great strategical importance?
7. Mention all the railways in Africa, giving, where possible, their termini.
8. Why are the German possessions in Africa comparatively useless?

AFRICA.—Political.

54



Scale 1:40,000,000 (631 miles=1 inch) 0 200 400 600 Statute Miles.

Sanson-Flamsteed's Projection (Sinusoidal equal-area)





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FIG. 162.—OLD CAIRO.

[Photochrom Co., Ltd.]

The view was taken looking west. The Nile runs between the old town and the Pyramids. A strip of green must be imagined stretching across the picture from right to left along the river course. Do you see any signs of sailing boats to indicate the position of the river? Which way is the stream running? Notice the Roman aqueduct. Do you see any trees? Account for their position. Why is there no vegetation in the foreground? The buildings visible are standing remains of three entirely distinct nations. What were these, and at what dates approximately did they occupy Egypt? Why are the roofs flat? Compare this view with Stockholm on page 72.

Egypt.

A The conditions which govern the development of Egypt are almost unique and require special notice.

Egypt proper is a country practically of no rainfall, yet, wherever the water of the Nile can be brought on to the land, the barren desert suddenly changes to fields of extraordinary fertility. The amount of country which is low enough to be reached by irrigation is comparatively small, less than 10,000 square miles. It extends only for a few miles on each side of the river, and therefore only becomes at all wide between Cairo and the sea.

The natural flooding of the Nile, owing to the monsoon rains in the southern part of its basin, takes place between June and October. When this flood subsides the ground remains fertile for a few months afterwards, and enables certain crops which ripen quickly in the winter season, such as lentils and wheat, to be grown. Then the soil naturally becomes baked and useless until the next flood. Improved methods of irrigation, brought to high perfection by British engineers during the last twenty years, have introduced quite a different system. By artificial barriers the river is held back, and vast reservoirs of water are formed. From these, water is let out as required, and so a system of perennial irrigation is made possible over much of the land. The area so treated has to be protected by embankments from the overflow of the Nile, and therefore an abnormally high

Nile is almost as dangerous to Egypt's prosperity as a very low one.

Under this latter system crops can be grown throughout the year, and in the summer season, when the heat is greater, such valuable crops as cotton and sugar are successfully grown. Nowhere else in the world have the results of irrigation engineering been so startling. Nearly ten million people, almost entirely agriculturalists, are now supported by the comparatively small fertile area which can be reached by the water of the Nile.



FIG. 163.—THE TEMPLES AT PHILAE.

Above the great dam at Assuan: showing the artificial lake, made for the modern system of irrigation. Notice the palm trees partially submerged, the hard rocky island just beyond the so-called "Pharaoh's Bed." How far is this from the Tropic? Could you have guessed the approximate latitude from the shadows cast by the sun?



FIG. 164.—ON THE BANKS OF THE NILE.

This primitive method of irrigation, which certainly goes back to the time of the Pharaohs, is still practised along the great river. The fellah (i.e. Egyptian peasant) is here seen lifting river water by means of a bucket attached to a beam with a counter-balance. The bucket will be emptied into an irrigation channel over the mat which can be seen just above the worker's right hand. This water will fertilize a small strip of garden-land. The pool from which the water is being drawn is itself kept full by another similar contrivance below. Sometimes three or four of these steps are necessary to raise the water from the river to the level of the land. This machine is called the "shadūf." Compare it to the more elaborate "Sakieh" shown below. Notice the Hamitic type of countenance. When it is considered that even such laborious methods as these enable men to earn a living by irrigation, it is easy to imagine the enormous value of the modern system of barrages and irrigation by gravity.

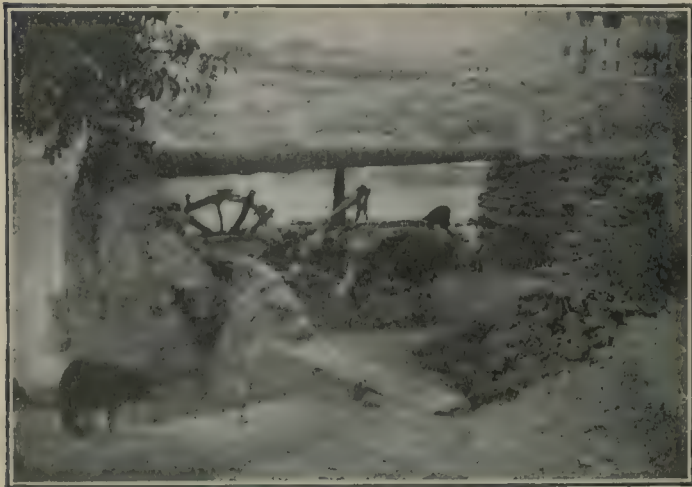


FIG. 165.—ON THE NILE BELOW THE FIRST CATARACT.

"A Sakieh": a primitive method of raising water from the river. The wheel, which is made to revolve by the oxen, works a line of earthenware pitchers attached to a rope. As these go round they pick up water from below and empty it, as they are turned over near the top, into a channel which carries it to a neighbouring village. The large building opposite is a modern hotel. Notice the lack of vegetation, and the rocks, part of the hard band which has caused the first cataract, and retarded the natural grading of the river. What kind of tree trunk is placed across from wall to wall?

The political importance of Egypt has been enormously increased by the opening of the Suez Canal, which now carries almost the entire maritime commerce between Europe and the East.

B On the inset map will be noticed three barrages. The first one, near Cairo, was designed by a French engineer, but owing to its being of necessity built on mud it was not considered safe to use, until strengthened by the ingenuity of British engineers, after the British occupation (1882).

By means of this work, a largely increased area in the delta was brought under irrigation, and the evils of a low Nile much mitigated. At Assiut a similar barrier has now been erected, and at Assuan, where the Nile breaks through a rocky obstruction, the largest dam in the world keeps back the flood water and forms a huge lake over 100 miles long, thus enabling perennial irrigation to be introduced on a far larger scale in middle and lower Egypt.

Along the banks the famous ruins of the temples of Luxor, the sites of Memphis and Thebes, and the Pyramids are indications of the wonderful civilisations of the past, which were made possible by the extraordinary natural conditions.

C In the future, no doubt, Egyptian irrigation will be still more extended. Among probable schemes is one for the thorough fertilization of the Fayum, a depression which in ancient times had a large population. The regulation of the sources of the Nile, and of its tributaries, will, no doubt, be taken in hand before long. The outlet of Victoria Nyanza may be controlled by artificial works; a new course may be cut through the marsh country between the Sobat and Khartum to prevent the enormous loss by evaporation and the obstruction to navigation caused by a peculiar growth of vegetation called "sudd"; while the Blue Nile and Atbara will probably be treated to a system of barrages similar to those of the Egyptian Nile.

QUESTIONS AND EXERCISES.

- A** 1. Estimate the distance between Assuan and Cairo, Port Said and Suez, by taking a degree of latitude as equal to seventy miles.
2. The scale of this inset is the same as that of the British Isles (Plate 13). How does the area of the delta compare with that of Wales? Would the Suez Canal stretch from London to Dover, from Holyhead to Dublin, from London to Liverpool?
3. How does the fertile area of Egypt compare with the unit of area?
4. What Mediterranean ports in Europe do you suppose have specially gained by the opening of the Suez Canal?
5. Which town is nearer to the equator, (1) Cairo or Cape Town, (2) Pretoria or Assuan?

B 1. In a journey up the Nile from Alexandria to the frontier of the Anglo-Egyptian Sudan, what engineering works, what towns, or objects of interest, would be passed by a traveller in order? At what season would the stream be strongest? How far could the journey be made by rail?

2. Does the Suez Canal form the political boundary between Africa and Asia? Is it connected with the Nile? Can one go by rail from Suez to Cairo?

3. What are the deserts called on each bank of the Nile? What is their value as a defence against invasion?

4. Trace the Inset Map, continue it to the south, and sketch

in the Nile valley as far as Khartoum on the same scale. Put in railways and name the tributaries. How many cataracts are marked?

REVISION QUESTIONS.

C 1. Write a list, with symbols, of all towns on the Inset Map. Be ready to repeat from Test Map.

2. What is the chief port of Egypt? Name two other ports on the delta. What sorts of exports and imports would you expect?

3. Do you think that the lake marked in the Fayum depression is perennial? If not, when would it be full?

4. Make a tracing of the entire Nile basin from the map of Africa. Name all tributaries and lakes and all towns marked on the banks. Shade in pencil all land over 1,200 feet. Mark a railway from Berber to Port Sudan, a new town about 30 miles north of Suakin.

5. How far would you estimate it to be from Cairo to Cape Town in a straight line? What proportion of the distance has hitherto been covered by railway construction?

6. Mention any other regions of the world where irrigation is of paramount importance.

7. Compare the history of the Euphrates valley with that of Egypt. Why has the former lost much of its fertility?



FIG. 166.—A PAPYRUS SWAMP.

This is the celebrated reed, from the pith of which the ancient Egyptians made paper. It is common on the Upper Nile and in all the tropical rivers of East Africa, wherever the current is slow. This particular picture was taken in latitude 5° S., longitude 38° E. In what political division is it? Notice the expensive method of transport, where there are no roads or railways.

A 1. Compare South America and Africa as to position in the world, area and configuration.

2. Why is there no great desert area in South America to correspond with the Sahara?

3. What countries in Central and South America and in Africa are cut by lat. 10° N., the equator, and the southern tropic?

4. Write down the name of the town in Africa (named in brown) which corresponds in each case most nearly in latitude to Georgetown, La Paz, Monte Video, Asuncion, Barbados.

5. Compare, in as many ways as possible, the Argentine Republic and British South Africa south of the Limpopo.

6. Give some account of the races of South America and Africa, exclusive of Europeans.

7. Give some account of the exploration of Africa by Europeans.

8. How have the present political divisions in South America and Africa been determined?

9. The natural products (exclusive of minerals) of South America and Africa are very similar. Can you account for this?

10. Go right round the coast of Africa from the Strait of Gibraltar, starting southwards, and name all political divisions, saying to what country each belongs.

11. Do the same for South America, starting south from Panama.

12. What political divisions in Africa are independent? what in South America belong to European nations?

13. Trace the map of Africa, putting in all river courses and railways. Mark with red ink the parts of the rivers which you consider navigable by river steamers.

14. What other parts of the world have tropical forests and deserts to compare with the Congo Forest and the Sahara? Are similar causes at work in all cases?

15. Treat the map of South America (Plate 52) as explained under C 6 (page 116), and be ready to insert the brown names.

16. Do the same for Africa (Plate 54), as explained under C 6 and 7, and be ready to insert the brown names.

B 1. Would you expect the climate and productions of the Lesser Antilles to correspond to those of the Cape Verde Islands? If so, why?

2. Compare the climate, productions, area, history, and value of British Guiana and the Gold Coast.

3. Compare the Congo basin and the valley of the Amazon as to climate and productions. Give reasons for resemblances.

4. Compare the mountain systems of these two continents as to structure, height, and results upon climate and the river systems.

5. Compare the railway development of the two continents. Do you notice any resemblances as to the position of the chief railway countries? Can you account for this?

6. Compare Bolivia and Rhodesia as to position, area, capabilities, products and state of development.

7. Circumnavigate these continents, starting south from Panama and Strait of Gibraltar, and give list of river mouths, capes and towns (in brown or blue) which would be passed in order.

8. Treat the map of South America (Plate 52) as explained below under C 6, but insert the brown and blue names only.

9. Treat the map of Africa (Plate 54) as explained below (in C 6 and 7), and be ready to insert the brown and blue names.

10. Write a short account of the distribution of races in South America and Africa, with historical explanation.

C 1. Compare the historical development of these two continents.

2. What advantages as to climate and natural harbours has South America over Africa?

3. Compare the probable influence of the Panama Canal over South America with the influence of the Suez Canal over Africa.

4. Trace the outline of the map of Africa (Plate 54), putting in main rivers and chief towns in black ink. Then place this over the map of South America (Plate 52) so that the equator corresponds, and trace in the leading features of South America in red ink.

5. On squared paper draw a map of Africa, given these co-ordinates: Where the Equator is cut by long. 20° E. (0, 0)—N.W. corner of inside margin (−3.9, 5)—N.E. corner (3.2, 5)—S.W. corner (−3.9, −4)—S.E. corner (3.2, −4)—Strait of

Gibraltar (-2.3, 3.9)—Cape Blanco (-.9, 4)—Cape Verde (-3.9, 1.6). Where meridian of Greenwich cuts the Niger (-2.1 1.8)—S. of Lake Tsad (-.7, 1.3)—Camerons Peak (-1.1, .5)—Mouth of Congo (-.8, -.8)—Cape Agulhas (0, -3.8)—Lourenço Marquez (1.2, -2.8)—Victoria Falls (.6, -2)—S. of Tanganyika (1.2, -1)—Zanzibar (2.1, -.7)—S.W. corner of Victoria Nyanza (1.3, -.3)—N. of Albert Nyanza (1.2, .2)—Cape Gardafui (3.3, 1.2)—Perim (2.5, 1.3)—Khartum (1.3, 1.7)—Suez (1.2, 3.2). Insert all details that you can from memory. On inch paper the scale will be 1 : 40,000,000.

6. Rule the inside frame of Plate 52, and all the lines of latitude, and longitude 60°, by accurate measurement. Mark along each

line of latitude the exact points cut by the coast, by measurement. Then sketch in the coast-line and rivers, and mark the political boundaries by dotted lines. Be prepared to fill in the map fully from memory, including the numbering of the lines of latitude, and the shading in of the areas above 3,000 feet.

7. Treat the map of Africa on Plate 54 in a similar way, marking longitude 20°E. Omit the inset map.

8. Write an account of past, present, and projected methods and schemes of irrigation in the Nile valley.

9. Write some account of the architecture shown in the various illustrations in Part V., and say by whom the most striking buildings have been erected.

CONTENTS OF PART VI.

(Sixth Term).

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(NOTE.—It is recommended to revise Plates 8 and 9 with the questions on page 29, at the beginning of each term.)

Definition and Historical Sketch.

A The United Kingdom of Great Britain and Ireland together with the Isle of Man and Channel Islands and the various British Colonies, Protectorates and Dependencies, make up what is commonly known as the British Empire. The bonds which unite the whole are indefinite but strong. The inhabitants of the Empire are all British citizens, acknowledge one throne, and have the right of appeal to the Privy Council in London. The protection of the British Navy for their trade throughout the world is the most striking direct benefit which these citizens enjoy. The strongest bond is a common sentiment, the inheritance of a common history. The full significance of this was only brought out in the South African War of 1900. Oddly enough, there is no common commercial policy among the various parts of the Empire. To achieve this is the aim of the most ambitious statesmen of the day. Free Trade within the Empire will perhaps be realised in the not far distant future.

Nearly all the distant parts of the world which are politically connected with Europe have been acquired by the nations that border the Atlantic. Their geographical position gave them the opportunity of sending great navigators over all the oceans. The British Isles, owing to their long sea-board and natural harbours, have been naturally more influenced than any other part of Europe by such geographical considerations.

From the time of Columbus onward, sailors from Spain, Portugal, Holland, France and the United Kingdom began those voyages of discovery and in search of wealth, which led to the establishment of great world empires. All the Spanish possessions in South America or the

Pacific are now in other hands, as the result of revolt or conquest by another Power. Much of the Portuguese world-empire has suffered the same fate. Holland retains her valuable colonies in the Dutch East Indies (or Netherlands India), while her South African possessions have passed over to the British. The old name of Australia (New Holland) and the present name of New Zealand serve to recall their discovery by Dutchmen.

In Canada and India, French and British traders and adventurers were for a long time rivals. The results of the Seven Years War secured these vast territories to the United Kingdom. The French-speaking Canadians of Quebec and the outlying French possessions in the Gulf of St. Lawrence and in India are reminders of what might have been the extent of the French Colonial Empire.

Organisation.

B The units which make up the British Empire can be divided into three classes:—

- (1) Crown Colonies, entirely controlled by the home government, such as Gibraltar, Trinidad, Ceylon, Straits Settlements and Mauritius. [The Indian Empire has a complicated system of official government, but all its officers are eventually under the control of the Secretary of State for India.]
- (2) Self-governing Colonies, which have elected Assemblies or Parliaments of their own. The Crown appoints a governor, and retains a veto over legislation: as in the Dominion of Canada, the Commonwealth of Australia, the Dominion of New Zealand, Newfoundland, the Union of South Africa.

- (3) Protectorates, which are ruled by native princes or chiefs, or by the officers of a chartered company. The degree of independence varies according to circumstances. In all cases, the relations of these dependencies with foreign powers are regulated by the home government, which guarantees their safety from invasion. Examples are : Uganda, Rhodesia, British North Borneo, Zanzibar.

Imperial Defence and Naval Stations.

C The whole British Empire is under the protection of the armed forces of the Crown. The Navy is responsible for the defence of trade routes, as well as of British Colonies and Dependencies in time of war. A system of fortified coaling stations and dockyards throughout the world has therefore become a necessity. Under the protection of the fleet the requisite number of troops can be sent to any threatened quarter. Most colonies and dependencies have also troops of their own for home defence. The Native Indian Army of over 150,000 men is the most numerous of these forces.

The following are the most important imperial dockyards and depôts outside the United Kingdom :—

Gibraltar, Malta, Hongkong, Bombay, Sydney, Simon's Town, Bermuda and Ascension.

Halifax and Esquimalt and Trincomali can also be used if required.

Other fortified coaling stations are as follows :—

Kingston (Jamaica), Freetown (Sierra Leone), Colombo, Singapore and Aden. Of unfortified coaling stations the most important are: Port Said, Suez, Perim, Walfisch Bay, St. Lucia, Durban, Hobart, and West Port (N.Z.)

The British Cable System is also of great importance in case of war, and has been developed partly with the aim of providing means of communication which cannot easily be interrupted by a hostile Power. The most important of these cables are indicated in the Chart of the World in Part I. (Plate 8).

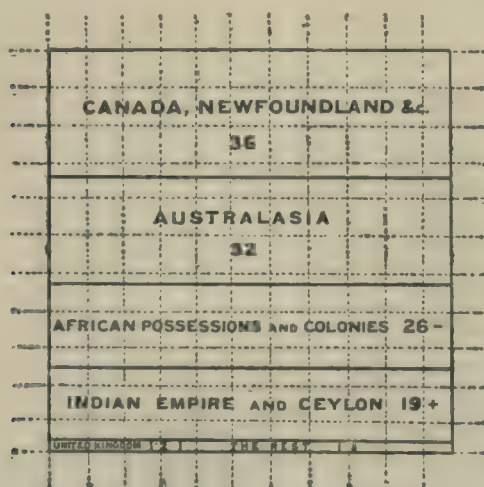


Fig. 167.—COMPARATIVE AREAS OF BRITISH EMPIRE.

Each unit = 100,000 square miles (total about 116).

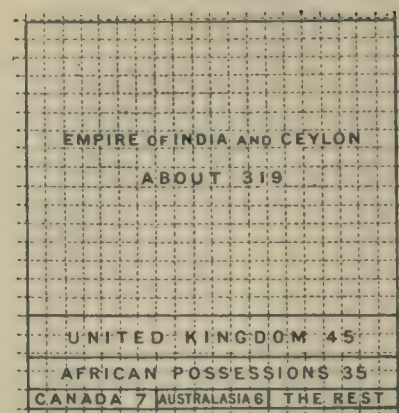


Fig. 168.—POPULATION OF BRITISH EMPIRE, 1910.
Total about 420 millions.

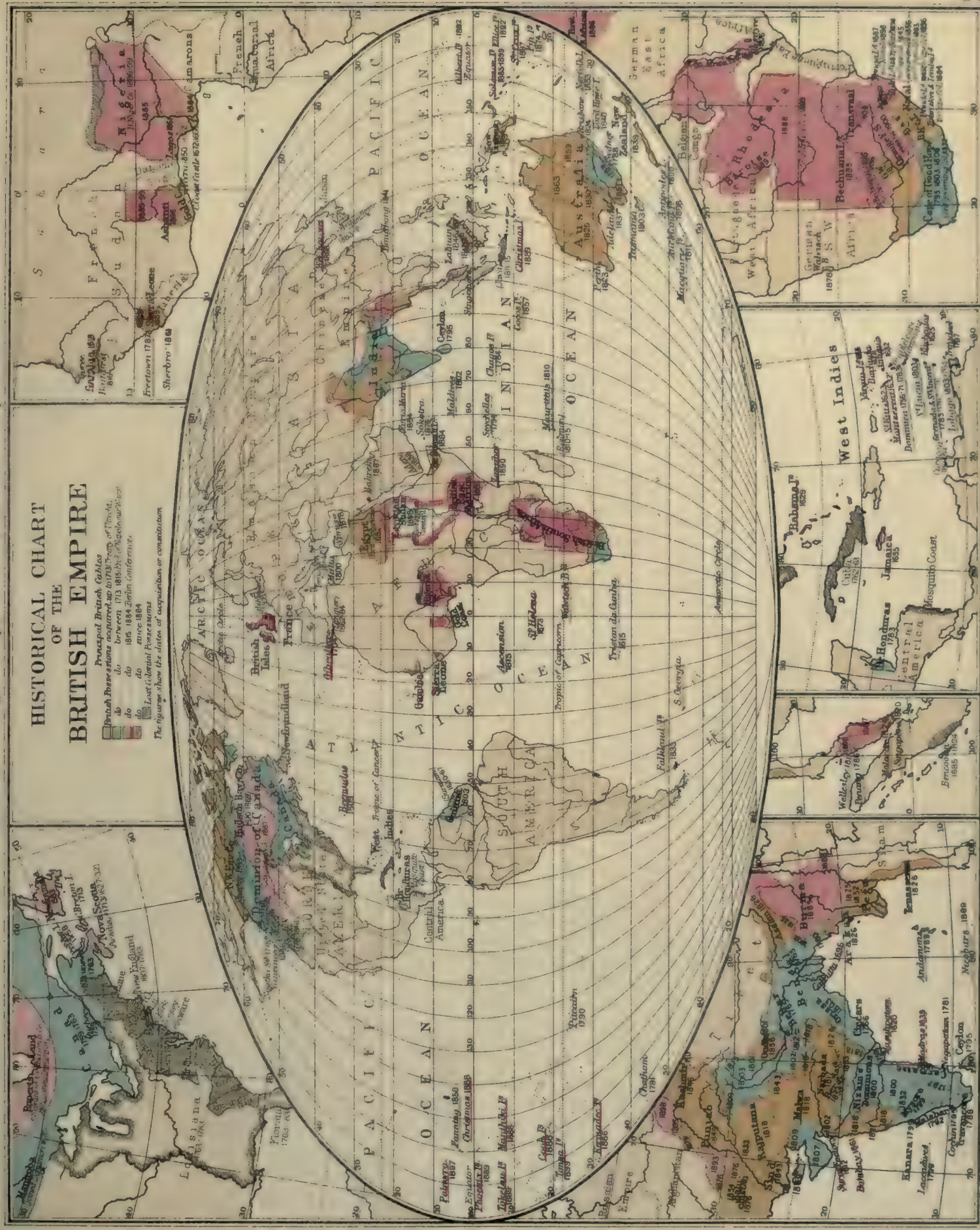
QUESTIONS AND EXERCISES on Plates 8 and 9 and the Historical Chart, Plate 56.

1. Write a list, with symbols, of all the British Colonies and Possessions marked on Plate 8. Be ready to repeat from the Test Map (Plate 9).
2. Write a list, with symbols, of the towns marked in the British Empire (on Plate 8), and say in what colony each is situated. Be ready to repeat from the Test Map.
3. What is the meaning of the various tints on Plate 56? What are the scales of the various maps? How many miles go to an inch in each case?
4. What foreign possessions had Great Britain previous to 1713?
5. Write down the chief lost Colonial possessions.
6. What are the chief acquisitions since 1884?
7. Between what dates has most of the Indian Empire been taken over?
8. Write down the chief parts of the British Empire in each continent. In which continent is there the smallest area belonging to Great Britain, in which the greatest (excluding Australia)?
9. Which of the West African colonies is the oldest?
10. What parts of Australia were first colonised? Give the earliest date.

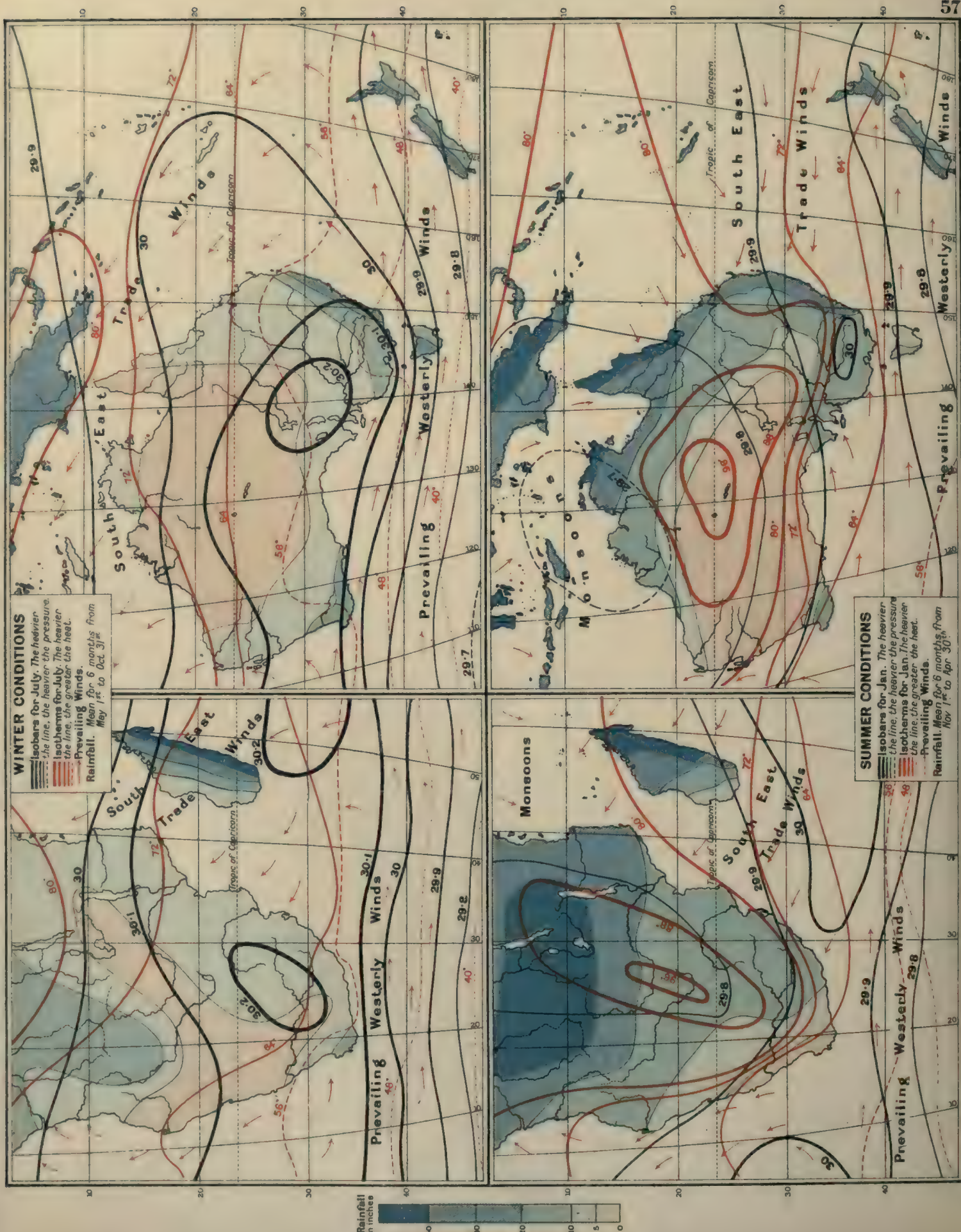
1. Make a tracing of the coast-lines of the world from the Historical Chart. Mark in the boundaries of all British possessions in red, and number them with symbols from Plate 9. Bring up the result for use as a test map.
2. Make a similar tracing, and mark in all the important British cables (from Plate 8). What is their strategical importance?
3. When was the first colony founded in New England? When did the Hudson Bay Company start? When did Newfoundland, Nova Scotia and Quebec become British?
4. In India, write down the dates of the foundation of Madras, Calcutta, and Bombay. What parts have been acquired since 1884?
5. In South Africa, write down the dates of the acquisition of Cape Colony, Rhodesia, Bechuanaland, British Central Africa and the Transvaal. When did Natal and Cape Colony become self-governing?
6. In West Africa, write down the dates of the first foundation of British influence in Gambia, Sierra Leone, the Gold Coast, and Lagos. Have any parts of Nigeria been lost owing to adjustment of boundaries?

1. Write a list of all the British colonies and possessions which are entirely within or partially within the tropics, and another list of those which extend to more than 40° from the equator.
2. Trace an outline map of the world from the Historical Chart. Mark in and name all Imperial dockyards, fortresses, and coaling stations throughout the world (see above). Be ready to discuss their importance.
3. At what date was British influence first established at Ascension, Fiji, New Zealand, Mauritius, Bahrein, Hongkong, Zanzibar, Trinidad, the Bahamas, Penang, and Singapore?
4. Between what dates did Cuba, Dutch Guiana (Surinam), Java, Curaçoa, and Bencoolen (in Sumatra) belong to Great Britain?

N.B. The facts are here given fully for reference, not necessarily to be learnt.



S. AFRICA & AUSTRALASIA.—Isotherms, Winds & Rainfall.



WINTER CONDITIONS
 Isobars for July. The heavier the line, the heavier the pressure.
 Isotherms for July. The heavier the line, the greater the heat.
 Rainfall. Mean for 6 months from May 1st to Oct. 31st.

SUMMER CONDITIONS
 Isobars for Jan. The heavier the line, the heavier the pressure.
 Isotherms for Jan. The heavier the line, the greater the heat.
 Rainfall. Mean for 6 months from Nov. 1st to Apr. 30th.

Rainfall in inches
 40 30 20 10 5 0

South Africa and Australasia compared as to Climatic Conditions.

A For purposes of comparison the maps of South Africa and Australasia on the opposite page have been drawn on the same scale and on the same projection, and with the same lines of latitude running right across the page.

Of course, the representation of Isotherms, Isobars and Rainfall at various seasons is only approximately correct, as sufficient data have not yet been collected. The general truths, however, are well brought out, and the striking similarity of climatic conditions is at once apparent.

The isobars and isotherms are corrected to sea-level, and therefore, if the actual pressure or temperature of any place is desired, allowance must be made for elevation above sea-level. The effect of the various temperatures and pressures upon winds and rainfall is, however, more easily brought out by the system adopted on these maps.

Ocean currents and the configuration of the land surface are not here shown. Other maps (Plates 4, 47 and 59) must be consulted.

A reference to the general remarks upon pressure belts and winds in Part I, page 15, will show how the areas here represented are related to the world in general.

In the upper two maps, showing winter conditions, the isotherms (red) go roughly from east to west, according to lines of latitude. In the month of July the land areas are naturally least warm. Owing to the fact that they are not very far from the equator and to their comparatively small size (when compared to Asia for example) there is not a marked continental cold area. However, this decrease in temperature over the land enables the high-pressure belt, along lat. 30° about, to assert itself more obviously. (See page 16.)

Over both areas there is a well-marked high-pressure area. This repels the winds, and therefore the rainfall at this season is markedly less than in the summer. The south-east trade winds in July are farther north than at any other season, and would naturally bring rain to the north-east coasts, unless repelled by the comparatively high pressure over the land.

Madagascar, being an island, is nearly free from this repellent influence, and therefore has a high rainfall over its eastern portion.

The prevailing westerly winds at this season are also in their most northerly position, and just reach the south-west corners of both continents. Hence the winter rainfall of the district round Cape Town and of the south-west promontory of Western Australia. New Zealand and Tasmania are always in the influence of these winds, and so receive rain at all seasons, especially on their western sides.

In the lower two maps (summer conditions) the winds and pressure belts are at their farthest southward limits; the temperature over the land becomes much greater than over the sea, the pressure is thereby reduced in the interior, and winds are able to penetrate much more freely

from the sea. The rainfall therefore is generally greater throughout this area.

As it is winter north of the equator, the monsoons are being forced outwards from Asia; and their influence extends as far as the northern coasts of Australia and to East Africa north of lat. 10° S.

The prevailing westerlies at this season are too far south to affect Cape Town, though they are drawn in by the low-pressure area over Australia, just far enough to give a slight rainfall to the extreme south-west.

QUESTIONS AND EXERCISES.

1. Make a tracing of these four maps in the same positions as on the plate opposite. Fill in the coast lines in fine ink lines. Mark the red isotherms by thin ink lines, and indicate their value by figures. Shade in the land areas with temperatures between 72° and 80° by diagonal lines in pencil, between 80° and 88° by diagonal lines in ink, between 88° and 96° by crossed ink lines, over 96° by solid ink. (Or get the same effects by gradations of colour.)

2. Make a similar tracing to bring out the isobars. Shade the whole surface (land and water) which has a pressure of over 30 inches with pencil, over 30.1 add diagonal ink lines, over 30.2 put crossed lines in ink.

3. How are differences in pressure, temperature and rainfall brought out in these maps? Mention the highest and lowest isotherms and isobars on the page.

4. What isotherms in July and January are cut in order, from north to south, by (a) long. 30° in the African maps, (b) long. 140° in the Australian maps?

5. Repeat question 4 for isobars.

6. Cape Town receives more rain in winter than summer, Natal in summer than winter. Explain exactly the physical causes of this.

7. Write down the mean temperatures of London in July, of Cape Town and Cape York in January, of London in January, of Cape Town and Cape York in July (see Plate 12). If these places are not on isotherms the temperature can be guessed to within a degree or so by the proportionate distance from adjacent isotherms.

B 1. Compare the northern half of Madagascar with the Cape York peninsula in winter and summer as to temperature, pressure, prevailing winds and rainfall.

2. Warm currents are predominant to the east of these maps, cold currents to the south-west. What effect does this have upon the rainfall of the south-western and south-eastern coasts of South Africa and Australia?

3. Why is New Zealand always fairly wet, much of Western Australia nearly always rainless?

4. Would you expect the Orange River and the river Murray to be similar as to their volume of water and seasonal variations? When do they carry most water?

5. When are the Victoria Falls most magnificent, and why?

6. The vegetation of Tasmania very much resembles that of England. Why is this?

C 1. The earth is in perihelion in January. What effect does this have on the summer heat of Australia and South Africa? (See page 14.)

2. What other parts of the world have a mean temperature of over 96° (corrected to sea-level) for their hottest month? (Plate 3.)

3. The North Island of New Zealand is crossed by isotherm 48° and 64° at different seasons, the centre of Australia by 64° and 96° . Account for the difference in range.

4. If Australia had her mountains concentrated in the interior, how would the distribution of rainfall be affected?

5. If South Africa were generally a low flat country with a high range like the Andes along the west coast, how would the distribution of rain be altered?

6. Contrast Madagascar and New Zealand, as to seasonal temperature, prevailing winds and distribution of rain. Give full reasons for the differences.

Vegetation and Population.

A The distribution of natural vegetation follows of necessity from the climatic conditions shown in the other maps. The lines, as here drawn, of course are not so definite in actuality. The changes between the various areas are naturally quite gradual. Wherever rainfall is comparatively great, natural forest springs up. Thus forest areas are always capable of cultivation, except when the land is very mountainous. Tropical forests are, however, so difficult to clear that they are not usually much interfered with. In the southern parts of Australia and New Zealand the burning of woods (called "Bush" in Australasia) has been carried out to a very great extent, to provide open ground for pasture or ploughing. There is a danger of these countries suffering in the future from a dearth of local timber, and state forest reserves have been formed.

The copious moisture of New Zealand favours a free growth of vegetation, evergreen trees and ferns and native grasses being characteristic. Hence the chief occupation there is the grazing of sheep and cattle; and the export of wool, frozen meat and dairy produce is the main source of wealth.

The south-eastern parts of Australia and South Africa bear great resemblances in their natural conditions. A strip of woodland and cultivation along the oceanic border is followed by a drier region, where cultivation gradually gives place to cattle country. As the rainfall diminishes farther west, this is followed by open grass lands, upon which vast numbers of sheep are reared, producing the best wool in the world.

The south-western parts of both continents in like manner are chiefly desert, while both have a fertile corner in the extreme south-west.

The north-eastern quarter of Australia would find its counterpart in Africa were it not for the existence of Madagascar, which intercepts much of the rain. As it is, Central Queensland resembles Rhodesia, both of which are suited for cattle and for cultivation in favoured districts.

The peopling of both South Africa and Australasia has been almost entirely controlled by climatic causes, and by the position of gold and coal. In the former, the greater density is owing to the large native population, which is almost absent in the latter.

There is a natural concentration in the regions near the great ports, where it is easy for native products to find a cheap route to external markets.

Johannesburg is a notable exception, where a huge inland town has been built on a goldfield.

QUESTIONS AND EXERCISES.

1. What parts of South Africa and Australasia are forest-clad, what parts desert? Give reasons.
2. Why is South Africa more fully populated than Australia? Where is the proportion of white men the greater?
3. Show how the distribution of population in Tasmania and New Zealand depends on natural causes.
4. Make a diagram on squared paper, with one million as a unit, to show the comparative populations of the British Isles (43), the Australian Commonwealth and New Zealand together (4), Cape Colony, Natal, Transvaal and Orange River Colony together (5), Greater London (7).

5. Make tracings of the lower Australasian map on Plate 57, and shade in pencil all the land area which receives more than 20 inches of rain during the summer months. Superimpose this tracing over the upper Australasian map on Plate 58, and show how far the character of the vegetation depends upon the summer rainfall.

B The districts round Cape Town and Adelaide are alike suited for the growth of the vine; sufficient moisture and plentiful sunshine have there enabled wine to be produced that can compete with the wines of France. Irrigation has enabled this culture to be extended up the valley of the Murray.

In Tasmania and New Zealand the parts where the rainfall is not excessive and the elevation comparatively low are most densely peopled, owing to the fact that it is easier to clear the ground and the temperature is more favourable.

QUESTIONS AND EXERCISES.

1. Africa and Australia, south of the tropic, both have four patches of concentrated population in the maps. Account for this.
2. Show why the vegetation in Australia and South Africa in similar latitudes is distributed in a similar manner.
3. The high parts of New Zealand and the low parts of Australia are scantily peopled. How far is this true, and how do you account for it?
4. How far are New Zealand and Madagascar similar as to vegetation and distribution of population? Do somewhat similar natural causes act in these respects on both islands?

C The south-western angle of Western Australia produces two famous red woods—jarrah and karri—both very large species of eucalyptus. This timber is much used for wood-paving and wherever durable hard timber is required. Its nearness to good ports makes it commercially valuable.

The kauri pine of Northern New Zealand also yields a valuable white timber, as well as gum. This latter is collected from the trees or dug up in the sandy subsoil, and makes the best varnish in the world.

New Zealand flax, grown chiefly in the lower Waikato valley, provides a tough fibre similar to hemp. Its export is rapidly increasing in value (see fig. 169).

Among crops successfully raised may be mentioned the sugar of Natal and Queensland, the apples of Tasmania, the oranges of New South Wales, and the tobacco of Cape Colony, Natal and the Transvaal.

QUESTIONS AND EXERCISES.

1. Mention some special vegetable products of South Africa and Australasia and explain what climatic conditions are necessary for these.
2. Are the areas of South Africa and Australia which are marked white in the Population maps ever likely to be peopled? Explain why not, or say what circumstances might cause men to live in those regions.
3. Compare the Argentine Republic with Australia as to position in the world, climatic conditions, and products (exclusive of minerals). Show how the same natural causes produce similar results.
4. Make a diagram on squared paper to represent the comparative populations of these countries and cities (figures given with 100,000 as unit):—New South Wales (14), Victoria (12), New Zealand (8), Tasmania (2), Cape Colony (24), Natal (10), Transvaal (10), Orange River Colony (4), Canada (57), Sydney (5), Melbourne (5), Glasgow (8), Southampton (1).
5. Write a short account of any special kinds of valuable timber trees found in Australasia. What circumstances make them of use in commerce? What other parts of the world send timber to Great Britain?

S. AFRICA & AUSTRALIA Vegetation & Population.

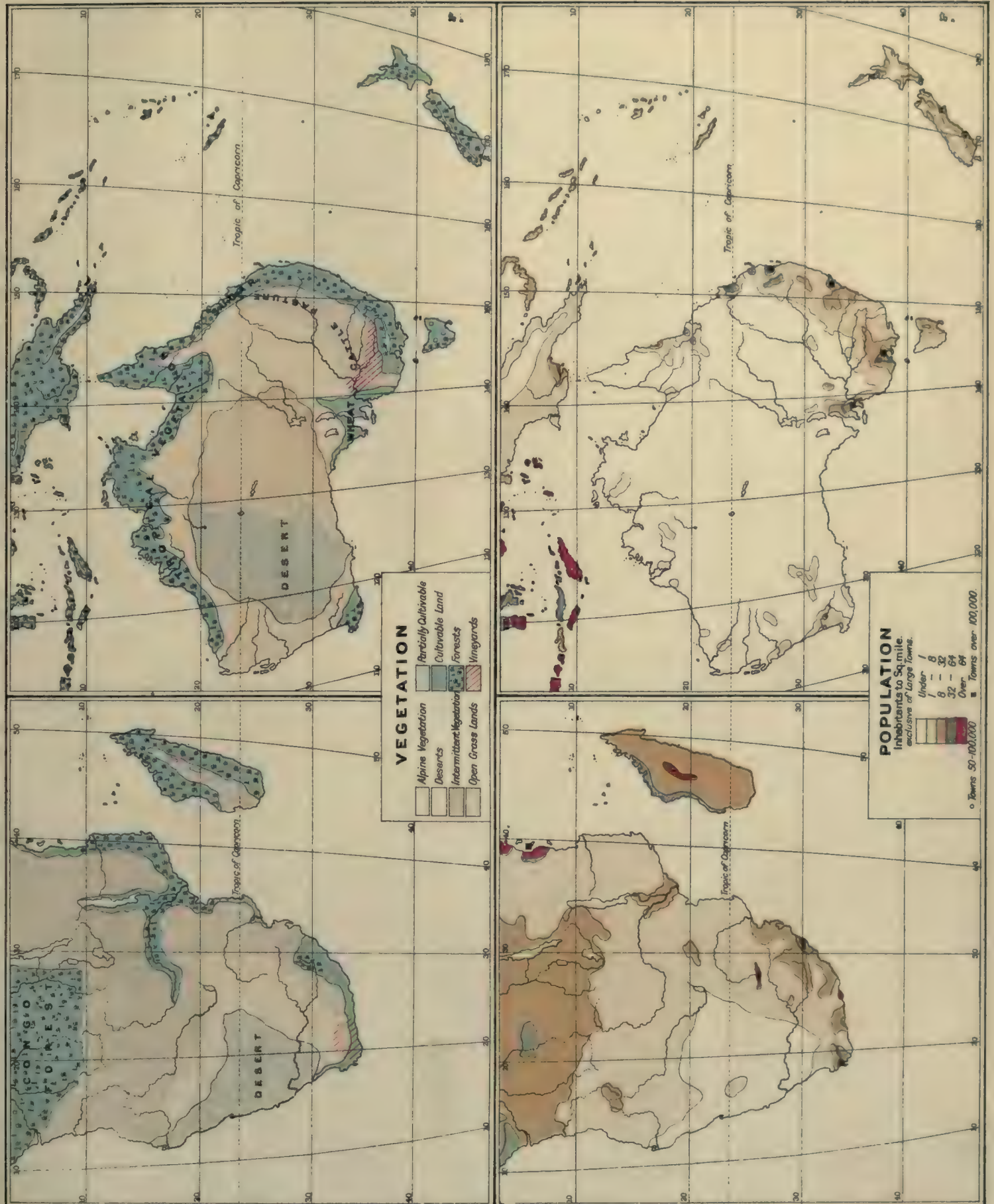




FIG. 169.—NEW ZEALAND FLAX.

Photograph taken in a garden in South Wales. The plant resembles a large yellow iris. In New Zealand it grows freely, about 10 feet high. Its leaves can be cut three times a year, and their fibres are used in the same way as manilla hemp, though the process of extracting them is rather difficult.

Australia and New Zealand.

A The Size, Position in the World and Surface Features of these countries can be easily ascertained from the maps given here and elsewhere (see questions on page 123).

As to Geological Structure, Australia was once, no doubt, of much larger extent, as can be seen by the shallow seas to the north, south and east. The great barrier reef, made of coral, marks the edge of the continental shelf towards the Pacific.

The main core of Australia consists of old crystalline rocks, overlaid generally by horizontal layers of sedimentary rocks, which have in many places been denuded away.

Wherever this denudation has exposed the underlying ancient rocks, minerals are more plentiful. Thus, along the great dividing range and in the exposed plateau of Western Australia most of Australia's valuable metals are worked.

Rocks of Carboniferous age occur freely along the Pacific border, and several coal-fields are worked, the one near Newcastle being the most valuable.

Tasmania no doubt was once an integral part of the continent, and apparently reproduces the same features—a crystalline centre with sedimentary rocks superimposed, generally in horizontal layers. In the former valuable tin mines are worked; in the latter, coal.

New Zealand, on the other hand, is made up largely of a great system of folded mountains, crystalline in the centre, and flanked by sedimentary deposits, sometimes

containing coal. The western half of North Island is chiefly volcanic and contains several active volcanoes.

The Coasts of Australia are, as a rule, not rich in harbours, Port Phillip and Port Jackson being notable exceptions.

In Tasmania Hobart has an excellent natural harbour.

In New Zealand there are a great many deep indentations, where safe havens for shipping can be found. The northern part of the west coast of South Island is the only part where there is a long stretch of harbourless coast-line.

Minerals.

A As can be seen from the map on Plate 59, gold is most widely distributed along the Eastern range, in Western Australia, and New Zealand, as would be expected from the geological structure. Though the amount of this metal produced is always gradually diminishing, as is usual in all gold-producing countries after the first period of development, Australia is still one of the greatest producers in the world. The value of its export comes second only to that of wool.

Coal is worked at a profit only when it is near the sea. The district round Sydney is much the most productive. In all the other states, except in South Australia, it is worked, though on a smaller scale.

Silver, tin and copper, though produced in considerable quantities, do not take a leading place in the world's production of these metals.

B Of the gold towns of Australia, Ballarat is the most famous, being the centre of what has been the richest goldfield in the world. Bendigo also owes its origin to the same cause. In West Australia, Coolgardie and Kalbarli have recently sprung into importance as the result of gold discoveries.

Newcastle produces three-quarters of the total amount of Australian coal annually raised. The whole of Australasia produces annually less than one-fortieth the amount of coal that is raised in Great Britain.

C Charters Towers, Mount Morgan and Gympie are the three leading centres of Queensland gold mining, Cué of the Murchison district in Western Australia, Orange of the less valuable mines in New South Wales, while in New Zealand the prosperity of Dunedin and Nelson has been largely caused by the nearness of similar valuable deposits.

In Queensland and Tasmania is found most of the tin of Australasia, Herberton being the most productive centre.

The Broken Hill district is by far the richest in silver.

Ipswich, Bunbury and Westport all owe much of their importance to coal.

History and Political Organisation.

A With the arrival of the convict ship in Port Phillip in 1788 the history of civilised Australia really begins. Free settlers gradually came in, and after long struggles succeeded in crossing the great dividing range; but it was not until the discovery of gold in Victoria and New South Wales, in about 1850, that any considerable population went to the country.

During the next ten years Parliamentary Governments

were granted to South Australia, New South Wales, Victoria, Queensland, Tasmania and New Zealand. It was not till 1890, soon after the discovery of the Western goldfields, that West Australia attained the position of a self-governing colony.

In 1901 all these States, except New Zealand, became federated as the Commonwealth of Australia. Canberra has been fixed on as the federal capital.

By this change a common fiscal and foreign policy is secured. There is a Federal Parliament, as well as the original State Parliaments.

B The existence of a Southern Continent, long suspected, was definitely settled by the voyage of Tasman in 1642, as a result of whose discoveries New Holland (Australia), Van Diemen's Land (Tasmania) and New Zealand were duly named by the Dutch. It was not till about 1770 that Cook fully investigated the east coast, and proved the insularity of New Zealand.

For nearly 100 years this latter group of islands was left unclaimed; then whalers and other traders landed in the island, and a mission was started by Samuel Marsden, in 1814, to counteract the terrible effects which spirits and firearms, introduced by unscrupulous Europeans, had had upon the native Maoris. In 1840 the British Government annexed the islands, forestalling the French. In 1856 Parliamentary government was granted.

The Maoris have proved the finest native race ever met with by Europeans. After many wars they have become settled citizens, and have their own members of Parliament.

C It was not until about 1800 that Australia and Tasmania were circumnavigated by Flinders.

For the next fifty years the exploration of the interior was carried out amid great hardships, owing to want of water. Likely spots were chosen for permanent settlements: Brisbane in 1825, Perth in 1830, Melbourne in 1831, Adelaide in 1836.

The original colony of New South Wales was gradually divided up. Thus Victoria was formed in 1853, Queensland in 1859; South Australia and West Australia grew out of independent settlements.

It will be noticed that many of the names in the map are those of great discoverers or important political personages at home. The aborigines of Australia, never numerous, are very low in the human scale, and have left few place names of their own language. In New Zealand, on the other hand, the poetic and more highly developed Maori language is everywhere common upon the map.

The Tasmanian natives, of a similar type to those of Australia, are now extinct.

Communications and Trade.

A As a general rule, the rivers of Australasia are not of much use for navigation owing to lack of water in Australia, to their rapidity in Tasmania and New Zealand. The Murray is the chief exception; but even this river is of uncertain volume, and has an unnavigable mouth.

In the map most of the railways are inserted. In

Australia they generally penetrate toward some gold-field of the interior, or connect the rivers of the Murray basin with the coast. In New Zealand, in spite of great physical difficulties, lines have been made, or are being made, to connect the chief towns, and supplement the sea routes.

Most of the external trade is done with the mother country; wool, gold, frozen meat, wheat and dairy produce being exchanged for the manufactures of Great Britain.

The lines of steamships between Australasia and Europe and America are very numerous and efficient. The bulk of the European ocean trade goes via the Suez Canal.

Though New Zealand is about the same distance from England via Cape Horn, not many ships go that way, owing to lack of intermediate trade, although winds and currents favour that route on the return voyage.

B The following rough estimate of the average annual value of exports from the Australian Commonwealth and New Zealand for the last ten years gives some idea of the relative importance of various products:—

| | | |
|---------------------------|--------------|--------------------|
| Total Exports | annual value | 78 million pounds. |
| Wool | " | 26 " |
| Gold | " | 17 " |
| Preserved and frozen meat | " | 4.8 " |
| Wheat | " | 4 " |

New South Wales and Victoria are the most productive of the seven States in most respects. New Zealand and Queensland wool, and West Australian gold have a considerable share in the total export values.

C A full railway map of Australia shows Melbourne as the centre of a radiating system of lines going in all directions. Sydney and Adelaide occupy similar positions, but with fewer lines. In Victoria all the lines are of the wide continental gauge (5 feet 3 inches), in New South Wales of the same width as in this country (4 feet 8½ inches), in Queensland 3 feet 6 inches is the standard, in South Australia there are mixed gauges, so that intercommunication is somewhat hindered.

A trans-continental line from Port Darwin to Adelaide is contemplated; also a connexion between West Australia and South Australia, north of the "Great Bight." Telegraph lines already traverse both these routes.

Among less important articles of export may be mentioned the coal of New South Wales—about 1.5 million pounds worth to neighbouring states. Queensland in the same way provides nearly one million pounds worth of sugar for other parts of Australia.

Taking a million pounds value as the unit, the following Table will give some idea of the importance of certain special exports yearly:—

| | |
|-----------------|--|
| New South Wales | Tallow and Hides, .6. |
| Victoria | Butter, 1.2. |
| South Australia | Copper, .5. |
| West Australia | Timber, .6. |
| Tasmania | Silver, .3; Tin, .3; Fruit, .3; Copper, 1. |
| New Zealand | Kauri Gum, .5; Butter and Cheese, 1; New Zealand Flax, .2. |

AUSTRALIA.



AUSTRALIA.—Test.



QUESTIONS AND EXERCISES.

Physical.

A 1. Between what degrees of latitude and longitude does Australia lie? How far is it from Cape York to Wilson Promontory (allowing 70 miles for a degree), from east to west along lat. 30° (allowing 60 miles for a degree)? Give answers to nearest hundred miles.

2. Between what degrees of latitude does New Zealand lie? The distance works out to about 1,000 miles. How many times more is this than from London to Birmingham?

3. Australia is about 3,000,000 square miles in area, New Zealand about 100,000. What ratio do they bear to the British Isles, which are about 120,000 square miles in area? Does Tasmania look bigger than Wales?

4. Estimate distance to nearest fifty miles from Wellington to Auckland, Melbourne to Sydney, Sydney to Brisbane.

5. Explain the exact meaning of the physical colouring on the map. In Australia where is the largest area (a) below 600 feet, (b) above 1,200 feet, (c) above 3,000 feet? Is most of New Zealand over 1,200 feet? Do you see any considerable plains below 600 feet in that colony?

6. Write a list, with symbols, of all the mountain ranges, peaks and rivers in the map, marked in brown. Be ready to repeat from Test Map.

7. Do the same for parts of sea, capes and islands.

8. Do you notice much inland drainage in Australia? Mention a river which does not reach the sea. Is any of the surface below sea-level?

General.

9. Make a list, with symbols, of all towns in Australasia, marked in brown. Be ready to repeat from Test Map, and to mention chief exports where mentioned. Reckon the trade of Lyttelton as belonging to Christchurch.

10. Wool and gold are the chief exports of Australasia. Do all the States have equal shares in these trades?

11. What towns (printed in brown) are connected by rail or steamship lines with each other?

Physical.

B 1. Estimate from the map on Plate 8 how Australia compares in size with the United States, Canada, Europe. [The areas are comparatively correct in this projection.]

2. What is the latitude and longitude of Wellington? In what European country would the exact Antipodes of this place lie? What town marked in the map of that country is nearest to the exact Antipodes?

3. Would Australia connect the British Isles and Canada if properly placed in the Atlantic? Is it a lesser distance from Cork to Newfoundland or from Perth to Brisbane?

4. A journey can be made from London to Wellington via the Suez Canal, or the Cape, or Cape Horn, or Panama? Is there much difference in distance between the routes?

5. Write down the latitude of Cape York, Brisbane, Melbourne, Wellington, London, New York, Cape Horn, Madrid, St. Petersburg. Arrange your list according to the distance from the equator.

6. Write a list, with symbols, of the mountain ranges, peaks and rivers in Australasia, marked in brown or blue. Be ready to repeat from Test Map.

7. Do the same for parts of sea, capes and islands.

8. Locate the Riverina, Gippsland and the Canterbury plains. What sort of surface do they appear to have? Judging from the Rainfall and Vegetation maps, what products would you expect from them?

9. The Australian Alps are far enough south to keep snow for most of the summer. What result does this have upon the Murray River? Would you expect the Darling and Cooper rivers to carry much water?

General.

10. Write a list, with symbols, of all towns in brown or blue. Be ready to repeat from Test Map

11. What towns (in blue) owe their importance to gold or coal?

12. Show by a diagram on squared paper the values of the exports mentioned above compared with total exports.

13. Trace the outline of Australia from Plate 59, in black ink; on the same paper trace the outline of Plate 43 in red ink, and of Plate 45 in blue ink.

Physical.

C 1. Compare Australia and Canada as to area and latitude. How many degrees nearer the equator is Melbourne than Montreal, Dunedin than Toronto?

2. No rivers reach the sea between Albany and Spencer Gulf. Why is this?

3. Write a list, with symbols, of all mountain ranges, peaks and rivers in Australasia. Be ready to repeat from Test Map.

4. Do the same for parts of sea, capes and islands.

5. Compare and contrast New Zealand and Italy as to area, shape, position in the world, climate and surface characteristics.

6. Make a diagram to show the comparative heights of Kosciuszko (7,300), Mount Cook (12,300), Mont Blanc, Everest and Ben Nevis.

General.

7. Write a list, with symbols, of all towns. Be ready to repeat from Test Map.

8. What do you know about the railways of Australia? What new lines are contemplated?

9. Go along all the lines which start from Perth, Adelaide, Melbourne, Sydney, Brisbane, Rockhampton and Townsville, and write a list of all towns served by them.

10. Represent graphically on squared paper the value of all exports mentioned above (under B or C) as compared with total exports.

11. From Plate 20 mention any other parts of the world which send to Great Britain similar products to those of Australasia. Are similar natural conditions to be found in all these regions?

British Africa.

A With the exception of Egypt and the Anglo-Egyptian Sudan, which have been dealt with in Part V., and Somaliland, all the remaining parts of Africa, which are British, are shown on the next map.

The Position in the World, Surface Features and Climatic Conditions can be easily inferred from previous maps, Plates 8, 47, and 57 (see questions).

British South Africa, south of the Zambesi, will be dealt with on this page, as being the only part far enough from the equator for permanent white settlement. Its history and development can therefore be treated apart.

The Structure of South Africa geologically is comparatively simple. The great tableland is composed largely of horizontally bedded rocks, much worn away in places, so that the ancient underlying crystalline rocks are exposed. Round the edges of the central mass the beds have a tendency to be twisted and faulted. Hence the irregular country in Basutoland and Northern Natal.

Most of the rich gold mines are in a curious conglomerate of somewhat doubtful origin.

The Coast-line is remarkably poor in good harbours. Artificial works are necessary in almost all the chief ports to make them comparatively safe for shipping. The river mouths are useless for navigation, with the exception of the Zambesi, whose delta can be ascended by small steamers.

The Mineral wealth of South Africa resembles that of Australia in many ways. Gold is by far the most important, and occurs, as can be seen from the map, chiefly

toward the east. The district of the Rand, near Johannesburg, is one of the richest goldfields ever discovered. The amounts hitherto produced by Rhodesia and Natal have been comparatively small.

Of the various coal-fields marked, the one in Northern Natal is at present the most valuable, as being most accessible. The field just south of Victoria Falls is now being worked by the newly made railway. In the Transvaal and Cape Colony considerable quantities are raised for local uses. The diamond region along the borders of Cape Colony is the richest in the world, and produces over four million pounds worth annually.

B Kimberley owes its origin entirely to the diamond mines. What other country produces diamonds? (See page 108.)

C Through Port Nolloth the copper of the dry western part of Cape Colony is exported to the value of about half a million pounds annually.

German South-west Africa also contains some valuable deposits of this metal.

History and Political Organisation.

A Though Portuguese navigators first rounded the Cape, the Dutch were the first to make a settlement, about 1650, as a stopping-place on the voyage to the Dutch East Indies. The district round the Cape became gradually colonised by Dutch farmers, and remained under Holland until taken in 1806, as a result of France compelling the Dutch to join her in war against the United Kingdom.

About thirty years later the abolition of slavery caused discontent among the Dutch farmers, many of whom "trekked" north to found the republics of the Transvaal and Orange Free State. Natal had been colonised by British in 1824, and now received a considerable Dutch immigration. Cape Colony became self-governing in 1872, Natal in 1893.

As a result of the war between the Dutch Republics and the British Empire, the Transvaal Colony and Orange River Colony were annexed in 1900. The grant of self-government to these has speedily led (1910) to a federation of the British South African States (i.e. Cape Colony, Natal, Transvaal and Orange Free State, with its old name restored) to be known as "The Union of South Africa."

From 1889 onwards, the British South African Company has gradually been developing the territory known as Rhodesia.

B As early as 1489 Bartholomew Diaz had rounded the Cape on his way to India; on Christmas Day (Dies Natalis), 1497, Da Gama discovered and named Natal; and soon after 1500 Portuguese settlements were established on the east and west coasts, where their possessions now are.

In 1688 a considerable body of Huguenots, exiled from France, settled near the Cape, and amalgamated gradually with the Dutch element. The Afrianders, sprung from these origins, now outnumber the British in South Africa.

Of the various native peoples, the Bushmen and Hotentots of the west have never proved formidable. The tribes of Bantu origin (called Kaffirs) are generally good

fighters, and as a result of their independent spirit, the native states of Basutoland and Bechuanaland have been left under their own chiefs as British Protectorates. The Zulus, after several wars with the Dutch Republics, were finally overcome by the British in 1879. Their country now belongs to Natal, though they are allowed to keep their tribal organisation.

C As a result of the political history of South Africa, many problems remain to be solved. The amalgamation of the Afriander and British elements, so as to form a federated South Africa, will certainly not be achieved without much difficulty.

The treatment of the various native populations is again sure to lead to difficulties. The Kaffirs far outnumber the whites, and are the natural source from which labourers have to be recruited in the hotter parts of the country. As the supply of such labour is insufficient, the introduction of Chinese and Indian coolies has been adopted as an experiment.

Communications and Trade.

A In the map most of the railways are shown. Their importance is very great, as roads are difficult to construct and the rivers are useless for navigation. Their general trend is from north to south, with branches to the various ports on the east coast. The Ocean route via the Atlantic is shorter, healthier and cheaper (owing to the avoidance of Suez Canal dues), and therefore Cape Town has a certain advantage over other ports. Northward, it is intended to extend the Rhodesian railways to the south end of Lake Tanganyika. Eventually this may become part of a Cape-to-Cairo railway. The overland telegraph already connects these two towns.

The trade of South Africa is chiefly supported by the production of gold, diamonds, wool, and hair. The latter comes from the Angora goat, and is often known as mohair. Most of the exports go to Great Britain in exchange for manufactured goods.

B Though the railways to Cape Town, Port Elizabeth and Durban bear the bulk of the traffic, still the lines to East London, Lourenço Marquez and Beira have a considerable share. Of the two Portuguese towns, the former is the natural outlet for the Transvaal, the latter for Rhodesia, and bulky goods can often be more cheaply sent through these ports.

The following figures, taking one million pounds as the unit, give the approximate average annual exports of British South Africa, south of the Zambesi:—

Out of a total of 40, gold may be put at 22, diamonds at 7·5, wool and hair at 3·5 (i.e. added together).

C Among products of minor importance, which go to make up the total export trade of South Africa, may be mentioned the copper (·5) and ostrich feathers (1·26) of Cape Colony, the coal (·5) and sugar (·07) of Natal.

British West, Central, and East Africa.

A Nearly all the remaining parts of British Africa lie within about 15° of the equator and so have similar conditions of climate and similar products. The great heat and general unhealthiness of these colonies usually prevent Europeans from permanently settling. Only in a few upland regions are the necessary health conditions to be found, as in the centre of British East Africa. The development of these countries has therefore been quite different from that of North or South Africa. Most of the trade has been done through or by natives, and all the severe labour. Europeans go to the country only to make money, and then return to their homes. So far, the greater part of the exports has been made up of such wild products as palm-oil, various oil-nuts, rubber and ivory. Plantations of coffee, cocoa and rubber are only just beginning to be successfully worked.

Nigeria is a name given to the region made up of Northern and Southern Nigeria and Lagos. The coast strip near the delta had been for some time exploited by British traders, when the Royal Niger Company was formed in 1882 to trade with the valuable basins of the middle Niger and Benue. Thanks to able administration, the vast territory was made to pay its way, active warfare was carried on against the slave traders, and treaties were made with the rulers of the great Mohammedan states of the northern half of this region. At the treaty of Berlin (1884) it was definitely declared to be within the British sphere of influence, and is now governed as a Crown colony. Zungeru has been made the centre of administration for the northern part, as it is outside the low-lying unhealthy region of the river valley.

The river is navigable to beyond its junction with the Benue, of which 600 miles are open to steamers of light draught. The delta is, however, difficult to pass, and contains no good port for ocean steamers. Therefore Lagos is the chief port of the territory, and has now been connected by rail with the populous interior. This railway has reached the Niger. The highest permanently navigable port on this river has been connected by rail via Zungeru with the great trading towns of the Mohammedan States to the north.

B As can be seen from the map of African races, on page 106, the northern part of Nigeria is peopled by Arabs, who have introduced Mohammedanism and an organised system of government, while the coastal region is chiefly peopled by a negro race. Between these two there is a mixed or negroid race. The land is everywhere fertile, and most of the inhabitants are agriculturalists or herdsmen. The collection of palm-oil and rubber is the main occupation in the southern and rainier parts; in the north, cattle are more numerous; the Mohammedan civilisation has introduced various local manufactures of leather and iron, and a large trade is carried on, some of it by caravans across the Sahara to Algeria and Tripoli.

C The Royal Niger Company, founded in 1882, was really the means of saving this region to Britain. Unless this proof of occupation had been produced, it would not have been possible to claim the country at the Berlin Conference. The great obstacle to development was for many years the slave-raiding habits of the Mohammedan rulers. The Sultan of Sokoto used to exact his tribute in slaves. Human beings, in fact, acted instead of coins as the most convenient form of currency. Several successful expeditions, from 1900 onwards, have been made to put down these practices. As a result of the expeditions named, the Government have taken over the entire territory, and peace has been gradually enforced everywhere.

The Sultan of Sokoto is the ruler of the Great Fula Empire. Kano, Kuka and Yakoba are all towns of large size (between 50 and 100,000), and considerable trade. Now that slave raiding has been abolished, and a settled government introduced through the Imperial officers, this country will probably become of great commercial value.

The whole of Nigeria (with its 400,000 square miles) contains at least 25,000,000 inhabitants. The Hausas of Kano and its neighbourhood are the chief traders, and have a well-developed literature of their own.

A coinage is gradually being introduced to take the place of the primitive "cowrie," or the easily transported human slave. The negro inhabitants of the delta have no religion beyond a fetish-worship. Human sacrifices and cannibalism have been suppressed with some difficulty by the Government.

A The Gold Coast and Sierra Leone are similar in many respects to Southern Nigeria as to people, climate and products. In spite of the very unhealthy climate, a valuable trade is carried on in rubber and palm-oil, and now the goldfields of Ashanti have led to the building of a railway, which will still further increase the value of the former territory. The rivers are practically useless for navigation.

Gambia, where there has been an English settlement ever since Queen Elizabeth's reign, is much more healthy, as it is farther from the equator than the other West African colonies, and the river is navigable for 200 miles and has a wide and easy estuary. French territory, however, cuts it off from the interior, and prevents expansion.

B Accra and Freetown are the capitals of their respective colonies. The latter has the best harbour in West Africa, and is a fortified imperial coaling-station.

C Throughout West Africa the greatest obstacle to the health of Europeans has been the prevalence of malaria. Of late years the spread of this disease has been traced to a species of mosquito. By carefully draining all the stagnant pools in which this insect is produced, a great improvement has already been achieved. The free use of mosquito netting has also saved many Europeans from this malady.

If the introduction of cotton proves a commercial

success, a great development of these colonies may be expected in the not far distant future.

A Uganda and British East Africa are two protectorates taken over by the Imperial Government between 1890 and 1895 for strategical and political reasons. Mombasa, the administrative centre of the latter, has been connected since 1902 with the great lake by a government railway, which may possibly prove a commercial success. Its main object was to make it easy to send Indian troops to the sources of the Nile, so important from an Egyptian point of view.

The high plateau in the centre of British East Africa seems suitable for Europeans, a rare exception in tropical Africa; and so the country may be eventually of great value.

Zanzibar is the residence of a Mohammedan Sultan, now under the protection of Great Britain. His predecessors ruled many hundreds of miles of the East African coast. The island is productive, and exports large quantities of cloves and copra (i.e. the produce of the coconut palm). It is the chief commercial centre of East Africa.

British Central Africa (now called Nyasaland Protectorate) is mostly an unhealthy region of tropical vegetation. Taken over as a Protectorate about 1890, it is well governed and organised. In the higher parts Europeans can live for a period, and coffee planters have established a thriving industry. Steamers can ascend the lower Zambesi and get about half-way up the Shire, from which point a railway extends northwards. Lake Nyasa, of course, provides a convenient waterway.

British Somaliland is a thinly-peopled quasi-desert country, famous chiefly for its big game. Much of it resembles the view given in Fig. 152.

B Zomba is the administrative capital of Nyasaland. Chinde is a free port at the Zambesi mouth, though in Portuguese territory.

C Blantyre is the chief centre of the small European colony of coffee-planters in the Shire Highlands. Wild elephants are preserved by government, and, if ever the African type is successfully tamed, may eventually prove useful domestic animals.

QUESTIONS AND EXERCISES.

Physical.

- A** 1. Write a list, with symbols, of all the mountains, peaks, rivers, lakes, capes and parts of sea, named in brown on Plate 61. Be ready to repeat from Test Map.
2. What regions in these maps are less than 600 feet above sea-level? Would you expect the lower courses of the Zambesi and Niger to be rapid? Judging from the Rainfall maps, when would you expect the Orange River to receive most water? Would it average more or less than the Zambesi?
3. How many degrees of latitude separate the north of Lake Nyasa from Cape Town, Johannesburg from Port Elizabeth?
4. Write down the latitude of Cape Town, Durban, Bulawayo, Mombasa, Lagos, New York, Madrid, London, Melbourne and Monte Video.
5. Say which of the following look bigger or smaller than England and Wales: Natal, Transvaal, Sierra Leone, Northern Nigeria. Compare, roughly, in size Wales with Lagos, with Gambia, and with Basutoland.

6. How far is it, to the nearest 100 miles (allowing 70 miles for one degree), from Cairo to Durban, Victoria Falls to Port Elizabeth?

7. What countries in these maps are traversed by the equator, by latitude 10° N., and by the Tropic of Capricorn?

General.

8. Write a list, with symbols, of all political divisions marked in brown in these maps. Add the towns (marked in brown) in each, with their symbols, and say to what European country each division belongs.

9. In a journey by train from Durban to Victoria Falls, what towns and countries would a traveller pass in order?

10. By what political divisions is Rhodesia bounded? What is its most important river?

11. Write down, with symbols, the four chief ports of South Africa. Say what are their leading exports, and for what regions they act as ports.

Physical.

B 1. Write a list, with symbols, of all the mountains, peaks, rivers, lakes and parts of sea, marked in brown or blue, on Plate 61. Be ready to repeat from Test Map.

2. Make diagrams on squared paper to show the comparative areas of Nigeria (i.e. North and South Nigeria and Lagos) (400,000 square miles), British Isles (120,000), Cape Colony (280,000), New Zealand (100,000), and Transvaal (110,000). Take 10,000 square miles as the unit.

3. Would a train (running at the average rate of twenty-five miles an hour) reach Bulawayo from Cape Town in thirty-six hours?

4. Where are the Great Karoo, the Kalahari Desert, and Victoria Falls?

General.

5. Write a list, with symbols, of all political divisions and subdivisions, marked in brown or blue; say to what countries they belong, and add the chief towns (in brown or blue) in each. Be ready to repeat from the Test Map.

6. Where are the chief gold and diamond fields of South Africa? Mention any towns which owe their origin to them.

7. Mention all the coast towns throughout these maps from which railways start inland.

8. Account for the importance of Cape Town, Lourenço Marquez, Salisbury and Mombasa.

9. Name the British self-governing colonies, crown colonies and protectorates, under these headings.

Physical.

C 1. Write a list, with symbols, of all mountains, peaks, rivers, lakes, capes and parts of sea, in these maps. Be ready to repeat from Test Map.

2. Describe generally the surface of Africa, south of the Zambesi. How does the elevation of the surface affect rivers, railways and climate?

General.

3. What countries and towns would a railway traveller pass between Beira and Cape Town, between East London and Lourenço Marquez?

4. Write a list, with symbols, of all political divisions and subdivisions. Add the chief towns in each, and the country which governs each. Be ready to repeat from Test Map.

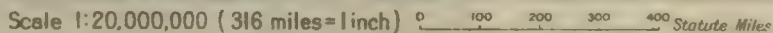
5. What are the termini of the Uganda railway? About how long is it? Discuss its commercial and strategical importance.

6. Mention all the railways in West Africa. Give the exact reasons, as far as possible, for their building.

7. Write an account of the history of British South Africa, south of the Zambesi.

8. Why has the development of Cape Colony and Natal been entirely different from that of Nigeria and Uganda?

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British North America.

A Included in the above term are the Dominion of Canada and Newfoundland with its adjoining territory along the coast of Labrador.

Position on the Globe and Comparative Area.

If an actual globe cannot be consulted, a very fair idea of the position of these regions in the world can be gained from the various maps in this book, especially from the large Map of the World at the end of Part I (Plate 8), and from the North Polar Map in the same Part (Plate 6).

QUESTIONS AND EXERCISES.

- A** 1. What other land area has the same relation to the pole and the Equator as British North America?
2. Taking a degree of longitude as equal to forty-five miles in latitude 50° , work out the extreme width of Eurasia (including islands) along this latitude and compare it with the distance (similarly measured) from the east coast of Newfoundland to the west coast of Vancouver Island. Would this coincide with the shortest distance?
3. Compare the area of British North America (about 3,600,000 square miles) with the unit of area, and the various continents (page 24 and Plate 1).
4. What latitude is taken as the dividing line between Western Canada and the United States? Compare the latitude of the extreme south of Canada with that of New York, London and Naples.
5. How many degrees from the pole is the extreme north of continental Canada, how many from the equator its extreme south?
6. Would the British Isles be contained in Hudson Bay? Do Ireland, Lake Superior and Newfoundland look about the same size? Is the island of Vancouver bigger than Sicily?

- B** 1. Calculate the distance between Lake Superior and Hudson Bay, between Winnipeg and the Arctic Circle, between Montreal and New York.
2. Mention towns in France and Russia on about the same latitude as Winnipeg; others in France, Japan and the United States in the same latitude as Toronto.

- C** 1. In a journey from Southampton via Halifax to Vancouver, would the sea or the land part of the route be the longer?
2. When it is noon at Greenwich, what time (about) is it at Vancouver, Winnipeg, Montreal and St. John's?
3. To what parts of Ireland and England does the extreme south of Hudson Bay correspond in latitude?

History and Inhabitants.

DATE TABLE.

| A | B | C |
|---|--|---|
| 1497. Cabot discovered Newfoundland. | 1000 A.D. (about). Norsemen discovered Nova Scotia. | |
| 1600 (about). First French Settlements. | | 1713 French Colony of Acadia (Nova Scotia). |
| 1759. Quebec taken by the British. | 1778. Cook's voyage along coast of British Columbia. | 1860 (about). Gold discoveries in British Columbia. |
| 1867. Dominion of Canada formed. | | 1885. Canadian Pacific Railway finished. |

A A look at the Historical Chart at the beginning of this Part (Plate 56), together with the dates given above, will help to remind the reader of the historical events connected with British North America.

After the discoveries of Columbus and Cabot, European explorers began to unveil gradually the secrets of the eastern coasts. Later, these were followed by French and British settlers, at first attracted by the fisheries off Newfoundland, then by the fur products of the interior. Nova Scotia and the St. Lawrence valley were colonised by France, just as the eastern coast, farther south, was peopled by British settlers (New England).

The inevitable conflict between these two nations was really decided by Wolfe's capture of Quebec. From that time onward British power and the English language began rapidly to spread over the continent.

When the United States were formed the Canadian portion of North America remained loyal. It was not till half-way through the nineteenth century that at last the home government, after many years of dangerous policy, granted practical freedom to the colonists.

B The influence of the earlier Norse discovery of North America may be neglected. While the East of Canada and Newfoundland were settled comparatively early, the great plains and mountains of the West remained practically unknown until the beginning of the nineteenth century.

The original Dominion of Canada did not include by any means all of the territory now belonging to it. British Columbia, for instance, did not join until 1871.

C It was the discovery of gold which led to the rapid development of British Columbia, just as the Yukon territory has been opened out in recent years. The Canadian Pacific Railway, the first inter-oceanic bond, was among the more or less immediate results of this discovery.

Of the original inhabitants, various Indian tribes and Eskimos, only few remain, perhaps 100,000 in all. As a result of historical causes, nearly one-third of the inhabitants of Canada speak French. Most of them are naturally in the older provinces of Quebec, Ontario and Nova Scotia. If a fully named map of Canada is consulted, a large number of French names will be found in the eastern portion of the Dominion, and off the coasts of Newfoundland.

Surface Characteristics, Structure, and Coasts.

A In the general remarks upon North America in Part IV the surface features of Canada were compared to those of South America and Asia.

The physical colouring of the next map shows three well-marked natural divisions: (1) The hilly country of the east, (2) the great plains of the centre, and (3) the extensive western mountain system.

Structural differences, however, have had greater influence upon the development of the country than differences in elevation.

The region south-east of the St. Lawrence estuary is a continuation of the folded Appalachian mountain system of the Eastern States, and is often of great fertility.

On the other hand, much of the provinces of Quebec and Ontario consists of an ancient plateau, much worn by glacial action, and generally denuded of soil, so that much of the country is unsuited for agriculture.

Along the St. Lawrence valley and farther west there are rich alluvial plains, and prairies covered with much fertile deposit left by the receding glaciers of the ice-age, or consisting of the dried-up beds of great lakes, often of great agricultural value. Still farther west the prairies rise in terraces towards the Rockies, but their underlying rocks have been undisturbed, and a large proportion of their surface is covered with deep natural soil.

The coasts both on the Atlantic and Pacific are obviously deeply indented. They provide admirable harbours. The fiords of the west are similar to the submerged valleys of Norway, and the great width of the St. Lawrence estuary is due to a like cause.

B The Structure Map of North America on page 76 will show the geological divisions of Canada.

The influence of the Laurentian plateau upon Eastern Canada has been immense. This region can never be a great agricultural country, owing to the thinness of its soil, but the natural water-power provided by its streams as they fall over the edge of the plateau into the St. Lawrence valley, is of enormous value, and has already been very largely used to run the sawmills and wood-pulp manufactories, which are fed by the natural forests of these regions. Niagara Falls and the Ottawa River are the chief sources of such power, at present.

C Of the Western Mountain System, about 400 miles wide, the Rocky Mountains proper form the eastern boundary. They rise abruptly from the great plains, but have some comparatively low passes, which enable the Canadian railways to surmount them by easy gradients from this side. The descent to the valleys of British Columbia is much more abrupt. Between the Rockies and the Pacific there extends a wide extent of broken plateau, and of parallel ranges. Among these have been discovered the rich gold deposits of Southern British Columbia, and of the upper Yukon.

Along the Pacific border the range dips beneath the sea to reappear in a series of detached islands, many of which consist of rocks of carboniferous age. Hence the valuable coal-mines of Vancouver Island.

Climate and Vegetation.

A If the Climate and Vegetation Maps of the World (Plates 3, 4 and 5) and of North America (Plates 36, 37 and 38) are consulted it will be easy to get a general idea of the natural conditions in British North America. Three climatic regions may be distinguished :—

- (1) The Eastern region between longitude 90° and the Atlantic, where there is a great range of temperature between winter and summer, partly owing to the cold ocean currents which come south from the Arctic, and no lack of rainfall. This therefore is a forest region.
- (2) The Inland region, including all the interior plains and much of the western mountains, where there is a typical continental climate, with very cold winters, and hot summers. The rainfall is slight, but as it comes almost entirely during the early summer, it is often very favourable for wheat growing. Where the moisture is insufficient for this, much of the country just east of the Rockies produces enough grass for cattle and sheep. The southern part of this region is usually treeless ; farther north comes a belt of coniferous trees, while along the arctic coasts is a strip of barren land, too cold for useful vegetation.
- (3) The narrow strip facing the Pacific, which has a typical oceanic climate, similar to that of the British Isles. The range of temperature is very small, and the rainfall is naturally great. The conditions are favourable to a free growth of trees, which attain very large size towards the southern part of this region.

As a result of these conditions, timber-cutting, or lumbering, is the chief industry of the east, the growing of grain (wheat and oats) of the centre, cattle-ranching and sheep-rearing of the western plains, and lumbering again of the Pacific slope.



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FIG. 170.—HARVEST IN THE PRAIRIES.

[Photochrom Co., Ltd.

This photograph was actually taken in the States, but it is typical of all the prairie wheat-fields. The surface is not quite level. Trees will grow when planted. Why is there not much natural forest ? Nearly all the land of Canada has been divided up into square plots, which are sold by the Government to settlers, or granted free under certain conditions. Labour is valuable in these countries, therefore the latest machinery is necessary for harvest operations. The sheaves are left ready bound by the machines. They only require putting into the "stocks" by hand. What are the conditions necessary for successful wheat growing ?

B Owing to the introduction of hardy varieties of wheat, autumn sowing has been found to prove successful even in Northern Alberta. Edmonton has therefore become the centre of a great wheat growing country. There the summer is hot, and the days become long as higher latitudes are reached, and so grain comes to maturity very rapidly; but, even so, much is often caught by the frost before harvest. The southern peninsula of Ontario, being in a southern latitude and surrounded by water, enjoys an exceptional climate. It is the richest and most populous part of Canada, and the northern shore of Lake Erie is famous for its grapes and peaches.

C During the winter time the south-westerly winds from the Pacific, after dropping their moisture on the mountains descend to the plains, immediately to the east of the Rockies, as dry warm winds, called "Chinook winds." These modify the climate very much, cause vegetation to revive, and enable stock to be left out all the winter, an enormous advantage to the rancher.

Communications, Industries, Trade, Distribution of Population.

A Communications.—All the natural products of Canada would be practically valueless without means of transport from the producing regions to the sea. Luckily there is in the St. Lawrence and the great lakes the most magnificent system of inland navigation in the world. Vessels drawing 27 feet can ascend to Montreal, which is therefore the chief ocean-port and centre of trade. Between this and the extreme west of Lake Superior vessels of 14-feet draught can now travel, thanks to the canals which surmount such obstacles as Niagara Falls and the rapids at Sault St. Marie (pronounced Soo). Besides the St. Lawrence, the Mackenzie, Saskatchewan and Yukon are navigable for river steamers for most of their courses, and the numerous lakes outside the St. Lawrence basin are of great use in local transport.



Copyright]

[Photochrom Co., Ltd.

FIG. 171.—AT SAULT ST. MARIE.

Locate the place in the map. A large lake steamer is here passing through the lock on the Canadian side. It is not very heavily laden. As the Canadian exports are much greater than the imports, in bulk, steamers frequently have to come west, without full freight. Between what two lakes is this canal? What other canals are there between this and the sea? What is the most westerly Canadian port to which this steamer could be travelling? What is the most westerly lake port in the U.S.A.? In what traffic is she most probably engaged? This is known as the "Soo" Canal.

Even so, without railway connexions, much of inland Canada would have remained undeveloped. The Canadian Pacific has enabled the farmers of the West to sell their products at a profit in the European market.

Thus the wheat of Manitoba can be taken by rail to Port Arthur, put on a lake steamer, and transported to Montreal, whence ocean steamers carry it to Liverpool. At the points where it has to change from freight car to lake steamer, or from lake steamer to ocean liner, there are to be seen huge buildings for storing grain, called elevators.

The chief objection to the St. Lawrence route is the fact that for four months in the year it is impeded by ice. Traffic has then to be diverted to the ice-free ports of New Brunswick or Nova Scotia, or to the seaports of the United States.

Industries and Trade.—As a result of natural conditions, the four chief industries of Canada are:—

- (1) *Agriculture*, which is highly developed throughout the area favourable to it, if suitable means of communication have been provided to bring its products to the market. The bulk of Canadian exports comes from this source. Wheat and wheat flour is the most important item; then come in order, cheese, bacon, cattle and butter.
- (2) *Forestry*.—The lumbering trade of the eastern provinces is enormous. The Pacific slope has a comparatively small share, owing to its geographical position. Timber is exported chiefly in sawn planks, but much of it is half-manufactured or converted into wood-pulp for paper-making. Ottawa is the centre of these industries.
- (3) *Mining*.—New developments are always taking place. Coal is at present (1912), in annual output, the most valuable of mineral products. Silver comes next, then in order of value nickel, gold and copper.
- (4) *Fisheries and Sealing*.—The sea-fisheries are chiefly worked by fishermen from Nova Scotia and Newfoundland. The most productive cod-fish ground in the world is found on the great banks of Newfoundland. Lobsters are also caught and canned in enormous quantities. The most valuable river fishery is on the Fraser River in British Columbia, where the annual catch of salmon is worth nearly one million pounds. Both coasts have a sealing fleet. Off the east coast of Labrador the Newfoundlanders in the spring meet the ice-floes, drifting southwards, upon which the seals have brought forth their young. Vessels from British Columbia are occupied in a similar slaughter along the northern coasts of the Pacific.

The Distribution of Population naturally depends upon the previously discussed conditions. It is graphically shown on Plate 38, and, as the provinces and districts of the Dominion are numbered according to population, on Plate 63, a fair idea of the distribution of inhabitants can be gained. It will be noticed that the province of Prince Edward Island is very thickly peopled. This is owing to naturally rich soil, and its position in the full stream of international commerce.

* By census of 1911, the order of provinces by population was Ontario, Quebec, Saskatchewan, Nova Scotia, Manitoba, British Columbia, Alberta, New Brunswick, Prince Edward Island.

B The Ottawa River is a useful help to the St. Lawrence navigation. Large vessels can reach the town of Ottawa, and beyond this a canal for smaller boats has been constructed across to Lake Ontario. There is a project to make a ship-canal from the Ottawa River to Lake Huron; if ever completed, this will save a great deal of distance between Lake Superior and Montreal.

The new railways in course of construction will open out vast territories in the north-west to profitable farming. Much of the Saskatchewan valley is admirably suited for wheat. Owing to the greater summer heat in the centre of the continent, the wheat belt here extends much more to the north than elsewhere (see isotherms of North America, Plate 36).

Canadian prosperity is growing fast, and so it is not possible to give any figures as to values of products and exports which can remain true for more than a short time, but the following figures (value in millions of £'s,) give an idea of the comparative value of the products of a recent year:—

| | |
|---------------------------------|------|
| Timber and wood pulp | 34.2 |
| Wheat | 28.5 |
| Oats | 26.0 |
| Coal | 5.4 |
| Silver | 3.6 |
| Nickel | 2.1 |
| Gold | 2.0 |
| Copper | 1.4 |
| *Cheese | 4.4 |
| *Butter | 3.2 |
| Salmon | 7.2 |
| Codfish | 5.9 |
| Other marine products | 16.8 |

* Factory returns only

C Among railway projects for the future may be mentioned the proposed line from the Saskatchewan Valley to Churchill on Hudson Bay. This line, now in course of construction, will enable wheat from the West to be shipped for Liverpool via Hudson Strait, by a more direct route than the present one. The only drawback is that Hudson Strait is probably blocked by ice for nearly ten months in the year. The open water, however, occurs just at the right season (late autumn) for the transport of the harvest.

The large amount of traffic on the great lakes can be realised when it is stated that a greater tonnage passes annually through the "Soo" canals, between Lakes Superior and Huron, than between Port Said and Suez. Canadian trade is very largely with the United States and Great Britain. The latter takes the greater share of Canadian exports, but the former sends to Canada more than three times the value of British imported goods. Naturally the bulk of Canadian imports consists of manufactures of iron and steel and of textiles.

Canada has, of course, a Protective Tariff; but since 1897 very large reductions in this have been made in favour of imported British goods. In spite of this, however, the bulk of the trade remains with the manufacturers of the United States.

By a system of bounties, the Canadian Government has caused a steel and iron industry to be started. The rich iron-ores of the Dominion may enable this to remain

profitable when the bounties are eventually removed. Plentiful supplies of hides and bark for tanning have also led to a very large leather-manufacturing trade.

QUESTIONS AND EXERCISES.

Climatic and Physical.

- A** 1. Look at Plate 5 (Part I) and write down what parts of Canada have an annual rainfall of more than 80 inches, of between 40 and 80, of between 20 and 40, of between 10 and 20, of less than 10 inches.
2. What effect does the rainfall have upon the character of the vegetation in various parts of the Dominion?
3. Judging from the Industrial Vegetation Map, on Plate 5, what would you expect the three chief products of Canada to be? What other parts of the world produce much wheat, and are the conditions similar in these places?
4. Find Plate 36, and from it write down the approximate mean temperatures for July and January of Vancouver town, Winnipeg and Nova Scotia. Account for the difference in range in the different parts. Compare these temperatures with those of London (Plate 12), and Moscow (Plate 25).
5. Write a list, with symbols, of the mountains, rivers, lakes, capes, straits and parts of sea (marked in brown). Be ready to repeat from Test Map. Notice the magnetic pole. Between what lakes are Niagara Falls?
6. Compare the surface characteristics of the provinces of Quebec, Ontario, British Columbia and of Greenland.
7. In what parts of Canada is railway construction easy; where difficult?

General.

8. Mention two inter-oceanic railways in Canada (either constructed or under construction).
9. Describe a journey from Montreal to Vancouver. Mention places of interest en route, the kind of country passed, and the chief occupations of the people, in various parts.
10. Write a list, with symbols, of the provinces of the Dominion of Canada and of Newfoundland (marked in brown). Be ready to repeat from Test Map. [N.B.—Each province marked in brown is self-governing, with its own parliament.]
11. Do the same for towns (marked in brown), saying in which province each is.
12. What are the chief ports of Canada? Name their leading exports.

Climatic and Physical.

- B** 1. Explain the distribution of pressure, the direction of the prevailing winds and the distribution of rainfall in Canada in winter and summer (Plate 37). Show exactly how these causes act upon each other.
2. What influence has Hudson Bay upon the isotherms in January and July?
3. During what period of the year does most rain fall in Manitoba? Can you account for this? Of what value is this seasonal rainfall to agriculture?
4. How much of Canada do you estimate, roughly, to be under 1,200 feet? Where are the regions over this elevation?
5. Write a list, with symbols, of the mountains, rivers, lakes, capes, straits, islands and parts of sea (marked in blue or brown). Be ready to repeat from Test Map.

General.

6. Write a list, with symbols, of the provinces (in brown) and districts (in blue) of Canada and Newfoundland. Be ready to repeat from Test Map.
7. Do the same for the towns (in blue or brown), and say to which province each belongs.
8. In what parts of Canada are gold, coal and iron-ore produced?
9. What towns would a railway traveller pass in order in a journey from Quebec, via Chicago, to Winnipeg?
10. Account for the importance of Winnipeg, Montreal and Vancouver (town).



Scale 1:25,000,000 (395 miles = 1 inch)

Modified Conical Projection

BRITISH NORTH AMERICA.—Test.

64



Climatic and Physical.

- C** 1. Compare Canada with Siberia as to climate, rainfall and natural products.
2. Explain the influence of ocean currents upon the climates of the Pacific and Atlantic coasts of Canada.
3. Compare the winter conditions round the Gulf of St. Lawrence with those of the regions round the northern part of the Sea of Japan. Which is the colder region, and why?
4. Compare as to climatic conditions and natural vegetation, Vancouver Island and Ireland, Labrador and Sakhalin, the Peninsula of Ontario and the Crimea.
5. Write a list of all mountains, rivers, lakes, straits, capes, islands and parts of sea. Be ready to repeat from Test Map. Notice Kicking-Horse, Crow's Nest, and Yellowhead Passes. What railways use them?

General.

6. Write a list, with symbols, of all the provinces and territories of Canada and Newfoundland. Be ready to repeat from Test Map.
7. Do the same for all towns, saying to what province each belongs.
8. Account for the importance of Port Arthur, Saulte St. Marie and Halifax.
9. Draw a map on squared paper of British North America, with these co-ordinates: where long. 90° W. cuts lat. 60° N. (0,0), N.W. corner of inside margin (-4.5, 4), S.W. corner (-4.5, -4.2), N.E. corner (4.5, 4), S.E. corner (4.5, -4.2), Cape Barrow (-3.4, 3.1), mouth of Mackenzie River (-2.7, 2.1), Dawson (-3.6, 1.6), Skagway (-3.9, .9), North of Vancouver Island (-4.1, -.7); Victoria (-3.5, -1.3), S.W. corner of Manitoba (-1.3, -1.9), Winnipeg (-.8, -1.7), Duluth (-.3, -2.3), Chicago (.3, -3.2), Saulte St. Marie (.7, -2.4), Niagara (1.4, -2.9), Montreal (2, -2.4), Quebec (2.2, -2), extreme S. of Hudson Bay (1.1, -1.5), Halifax (3.2, -2.2), Cape Race (4.2, -1.4), Cape Charles (3.5, -.6), Cape Farewell (3.8, 1.1), Cape Chudleigh (2.2, .3).

The above may be done with or without the map. Fill in from memory all names and details that you can. Shade in pencil all land over 3,000 feet. Inch paper will give a scale equal to that on Plate 63.

Indian Empire and Ceylon.**Position in the World. Area.***QUESTIONS AND EXERCISES.*

- A** 1. Compare the area of the Indian Empire and Ceylon (1,600,000 square miles) with the unit of area. How does Ceylon compare with Ireland?
2. What is the latitude of Cape Comorin and of the extreme north of India? Estimate the distance, roughly, in miles (taking 70 miles to 1 degree).
3. From London to Edinburgh is about 350 miles. Measure the distance from Bombay to Calcutta (the scale of miles at the foot of the map will give an approximate result), and say how many times greater it is.
4. Mention three towns in other countries or continents in the same latitude (about) as Calcutta. What is the latitude of Madrid, London, New York, Rio de Janeiro and Cape Town?
5. About what proportion of India is within the tropics? How many degrees is the nearest part of India from the north pole, of Ceylon from the equator?

- B** 1. When it is noon at Greenwich, what time is it at Madras? What is the difference in time (about) between Karachi and Rangoon?
2. Compare, roughly, as to size and latitude, India, Arabia, Mexico and Australia.
3. What are the three great peninsulas of Southern Europe, of Southern Asia? Do you notice any resemblances in relative position or natural boundaries and configuration between Italy and India?

- C** 1. Write a list of all British possessions which are within the limits of latitude covered by India and Ceylon, both north and south of the equator. (Plate 8.)

History and Races.*DATE TABLE.*

| A | B | C |
|---|---|---|
| | | Darius, 500 B.C.
Alexander, 323 B.C. |
| | About 900 A.D.
Mohammedan
Invasion. | |
| 1612. First British
factory.
1757. Battle of
Plassey.
1857. Mutiny. | | 1877. Indian Empire
declared. |

A The earliest inhabitants of India of whom any trace is left were a short, dark race. Many of their nearly pure descendants are to be found in the Southern Deccan. Various invading races have at different times found their way into India by the Bolan and Khaibar passes and by the Brahmaputra valley from Central Asia. Some of them have been of the white type, such as the Aryans, some of the yellow Mongolian stock. Of the former, many fairly pure descendants are still to be found in Rajputana. The latter have overrun much of Burma. These invading races intermarried with the darker aborigines, and the result is that India is now inhabited by people of very mixed origin. There are in fact hundreds of different varieties, and scores of different languages.

In the sixteenth century European nations began to make trading settlements. The Portuguese, French and British thus came to gradually acquire more and more influence in the country. Soon the French and British began to interfere in the affairs of the various native rulers. As a result, both nations gained a certain military prestige, which brought them into conflict during the Seven Years War. The Battle of Plassey really settled which Power was to be paramount in India. For the next hundred years the East India Company developed and ruled the country. After the Mutiny, the Government had to take over the task of ruling. Since then, various additions, by conquest or otherwise, have gradually brought the Indian Empire to its present limits.

B It is a mistake to suppose that the word Hindu is a racial name. It is simply used to distinguish those who acknowledge the existence of a priestly or Brahmanic caste, and who adopt certain religious principles. Both Buddhism and Brahmanism apparently originated in India. Adherents of both these religions are known as Hindus.

About 900 A.D. invading Afghan and Arab races introduced Mohammedanism, and converted many of the inhabitants. Later on, colonies of Jews settled in the country, and a sect of fire-worshippers or Parsees from Persia. These are not really numerous in either case. Since the time of the Portuguese settlements, Christianity has slowly been making converts, but even now not 1 per cent. of the people have accepted this belief.

C The invasion of the Punjab by Darius and the Persians, and by the Macedonian Alexander did not leave behind any permanent trace. These quick conquests are typical of the easy way in which

the peoples of the northern plain have again and again been overcome by conquerors from beyond the Himalayas. At the present moment the intricate political boundaries between the various native states and the regions ruled directly through the British Governor-General (or Viceroy) are a result of the complicated historical causes which have gradually brought about the Indian Empire of to-day. (See page 137.)

Surface Characteristics, Structure and Coasts.

N.B.—The Physical Exercises on page 136 should be done here.

A The physical colouring of the map at once shows that India (exclusive of Burma) can be divided into three regions.

- (1) The mountain wall to the north, consisting of the Himalayas and the bordering ranges to the north-west. The lowest pass over the Himalayas is 17,000 feet; but through Afghanistan there are no insuperable obstacles. In fact, nearly all the invasions of India have come by routes through this country.
- (2) The low plain of the Indus and Ganges, largely composed of alluvial soil brought down by the rivers. Actual rock is not found at all near the surface; hence road-making is not easy.
- (3) The southern plateau, consisting generally of horizontal layers of rock, and so being a true tableland. There are large tracts of broken country, however, caused by unequal weathering of the rocks, and by the great basaltic flow which covers much of the Northern Deccan. When weathered this produces the celebrated black soil so suitable for cotton growing. The Western Ghats obviously form a steep face to this tableland toward the Arabian Sea, and roads and railways have with difficulty been made through certain passes.

The Coast-line is singularly devoid of natural harbours. The indentations to the north-west are shallow, and most of the rivers have deltas difficult to navigate. Bombay is about the only good natural harbour. Karachi and Colombo have been made good ports by artificial works. The Hugli is kept open only with great difficulty, and Calcutta is one of the most dangerous of the world's leading ports.

B The Aravalli hills, rising to about 5,000 feet, are able to cause a certain amount of rainfall, and bring the desert conditions of the "Thar" to an end.

The Deccan plateau is highest towards the south, where the Nilgiri hills almost reach 9,000 feet. South of these comes the remarkable gap, through which the railway runs, and then the Cardamom hills make a lofty termination to the peninsula, reaching about 10,000 feet.

Just north of the Gulf of Manar, a curious ridge of coral reefs and islands stretches across to Ceylon. It is so continuous that there is no natural deep-water channel through it, and big vessels keep south of Ceylon. A ship canal is being formed through the ridge. Burma consists of several parallel mountain systems, running north and

south, with long narrow valleys between them. Communication is therefore difficult from east to west.

C The Himalayas, generally speaking, consist of a core of granite with sedimentary rocks of comparatively recent origin folded up against their southern face. Marine fossils have been found at a height of over 18,000 feet.

Curiously enough, the rocks underlying the great plains must have been laid down before the main uplift of the Himalayan system.

Between the plains and the Deccan plateau, which begins south of the Tapti valley, there are a series of older sedimentary rocks, including coal-bearing strata towards the east.

The Deccan beneath the basalt consists largely of rocks of the cretaceous age, into which many of the rivers have eaten deep gorges.

Seasonal Climates.

A The maps on Plate 65 give a good general impression of the different climatic conditions in India at different seasons. Great care must be taken to notice the exact meanings of the various lines and tints.

First of all as to Isotherms. These are drawn in the first map (to the left) to show the normal temperatures in the coolest month. It will be noticed that the decrease is pretty regular from south to north, as the centre of Asia is then a reservoir of cold. North of the tropic a well-defined cool season is experienced between November and February. On the right-hand map it will be noticed that the hottest area is not to the south, but toward the north-west, where deficiency in rainfall allows the full heat of the sun to be felt. In the rainier parts of India the hottest season is generally in May, just before the main monsoon bursts and helps to cool the atmosphere.

The Isobars are also drawn for the months which show the greatest difference.

Owing to the position of India between the largest continent and the largest oceanic area (i.e. the Indian and Pacific Oceans), the pressure is governed almost entirely by the great differences in the temperatures of Central Asia. The extreme cold of winter therefore causes a high barometer over Tibet, while the intense heat of summer brings about a low pressure area over Baluchistan. Over the ocean the changes of pressure between summer and winter are not great.

The result of these conditions is that typical monsoon winds are developed, as shown by the arrows. They blow, generally speaking, *towards* the land from May to October; *from* the land from November to April. The change of direction is, of course, not sudden nor absolutely regular, and local variations may occur.

If the configuration of the surface is kept in mind, it is possible to account quite easily for the **Distribution of Rainfall**. (See Plate 66.)

During the south-west monsoons, most rainfall naturally occurs where the steep slopes of the country are at right angles to their direction, as can be well seen along the Western Ghats and Himalayas. The plains of the lower Indus are passed over by the monsoon without much

rain being dropped, as they are low and hot and do not cause the moisture to condense.

The flat delta of the Ganges, on the other hand, receives ample rainfall. This can be explained chiefly by the isotherms. There is no well-defined heated area as in the lower Punjab. The monsoons here blow almost due north across the isotherms from the warm Bay of Bengal, and readily drop their moisture on the least fall of temperature caused by the elevation of the land. As the slopes of the mountains in Assam cause them to suddenly rise, the rainfall soon becomes enormous. Over 800 inches have been measured in a single year in this region.

The rainfall over the extreme south-east of the peninsula and Ceylon, during the north-east monsoon, is easily explained.

B Several small exceptions to what would be expected as to distribution of rainfall can be explained by the fact that the six months chosen to represent winter conditions do not exactly tally with the direction of the monsoons. Thus, all along the southern slopes of the Himalayas there is a certain amount of precipitation during the winter. Most of this falls early in November, before the monsoons have entirely changed their direction. Again, any air currents containing moisture which pass over this great range are forced to part with it in the form of snow, which falls occasionally even during the winter.

The rainy strip along the coast of Assam and Burma can be accounted for as above, and also by the fact that any local variation of pressure might reverse the winds for a time and so bring rain from the Bay of Bengal to the hilly coasts of those regions, even during the dry season.

Vegetation and Population.

A The results of the foregoing conditions upon Vegetation are at once apparent. The heat received is sufficient, over most of India, to bring to maturity all sub-tropical vegetation. Wherever moisture is duly distributed, cultivation is usually fully developed. The absence of coal over most of India causes agriculture to be almost the only industry for the great majority of the people, and therefore the distribution of population follows nearly directly upon the natural fertility of the country.

Most of the Indian Empire would naturally be covered with a forest growth, but the enormous population of nearly 400 millions has been forced to use most of the available area for agriculture. Forests are therefore found only in the mountainous regions of the Western Ghats or Himalayas, or the broken country of Central India or Assam, or the river valleys of Burma, where the population is not so numerous. State protection to the forests has often been found necessary.

The various districts marked off on the map for cotton and rice are, of course, not the only parts where these crops are raised. The somewhat arbitrary lines which enclose them do give, however, a generally true impression. Wherever low-lying land can be easily flooded by natural or artificial irrigation, rice is a leading crop.

The chief cotton area of India in the Northern Deccan

and Bengal is the result of somewhat peculiar conditions. Here a decomposed volcanic rock yields a deep and fertile black soil, very retentive of moisture, and therefore the monsoon rains are sufficient to grow the plant without irrigation, which is necessary for cotton-growing in the Ganges valley.

Tea requires well-watered and well-drained mountain slopes, and has been most successfully introduced during the last thirty years in Assam and Ceylon. Nearly all the tea consumed in the United Kingdom comes from the Indian Empire and Ceylon.

North of lat. 20° there is a well-defined cool season, and in favourable years there is a large production of wheat, grown as a winter crop, in the Central Provinces and the Punjab. It does not, however, provide any large proportion of the food-grains of the people—various millets, pulses and rice being their chief means of nourishment. Jute is able to stand the severe flooding of the Ganges delta, and is there a leading crop. Its long fibres are used for making sacks, and ropes, and carpets, and a very large export trade has sprung up with various towns in the United Kingdom—notably Dundee.

The areas of greatest Population naturally correspond to the regions of moderate elevation which have plentiful rainfall, or to the great river valleys where irrigation is possible, either by canals from rivers, by tanks, or by artesian wells.

B The most valuable timber in India is teak, which grows freely on the Western Ghats and in Southern Burma. Besides being a fine-grained wood, it contains certain oils which prevent various insects and animals from attacking it—a point of great value in shipbuilding and in tropical climates.

The indigo shrub produced the best blue dye before the discovery of an equally good mineral blue in Germany, and even now is much grown in Bengal and Madras.

Opium is produced from the seed-vessel of a species of poppy, especially in the district round Patna and where it is marked in the map. All the opium grown has to be sold to the Government, and a large revenue is obtained by its export, chiefly to China.

Humped cattle are the beasts of burden in most of India, and are, of course, found everywhere. They have not unnaturally been chosen as specially sacred by the Hindus. (See Fig. 174.)

C Various oil-producing plants are being largely grown in the well-watered parts of India. The seeds, which contain the oil, are exported to this country to the value of over six million pounds annually. Linseed (the seed of flax) provides the oil for most of the linoleum and paint used in commerce. Colza-oil is derived from the kind of mustard known as rape, the chief supply of which comes from India.

From the palm-trees of the southern coasts and of Ceylon is procured copra, or dried coco-nut kernel, from which lubricating oil and soaps are manufactured in Great Britain.

Cinchona trees have been successfully introduced from South America, and provide the valuable Peruvian bark, from which quinine is manufactured. Ceylon has proved

the most suitable locality, as the tree flourishes best on high ground near the equator.

Coffee does well in Southern India and Ceylon, but the value of the plantations has been much reduced by a disease, and tea-growing has largely taken its place.

In many parts of India the rainfall derived from the monsoons cannot be relied upon for certain. At least once in every ten years the rains fail. The only remedy against absolute failure of the crops is then to be found in irrigation, which is therefore necessary, not only in the areas always deficient in rainfall, but in the regions of uncertain rainfall.

In the low plains near the great rivers irrigation by canals is possible. These are either constructed to carry the surplus water in flood time—inundation canals; or are made to carry the river water to the land at all times—perennial canals. Much of the Ganges valley, parts of the Indus basin, and the deltas of the Cauvery, Godavari, and Mahanadi are made fertile by such works.

Throughout the Deccan and in parts of Madras the system of irrigation by storage tanks is found, but, of course, their supplies do not last for long.

In the parts of the Ganges valley not reached by the irrigation canals large areas of land are fertilised by means of wells.

The following extract from a newspaper gives an insight into the state of affairs when the rainy season has been unsatisfactory. (Notice the date.)

CROP PROSPECTS DURING WEEK ENDING OCT. 28, 1905.

Bombay, prospects greatly improved in Deccan by rain reported last week, and no present cause for serious anxiety, though rain is still wanted.

No rain in United Provinces and Central Provinces, where conditions are unchanged. Spring sowings are germinating well, but rain is much wanted for rice and other standing crops in several districts.

Rajputana, no rain. Harvests in progress with poor out-turn. Prices are high. Emigration continues.

Central India, spring crop prospects unfavourable. Test relief works opened in some districts. Haidarabad, rainfall slight and partial. Spring crops and sowings retarded in parts and cotton suffering; suspensions contemplated.

Bengal and Burma had good rain, and crops promise well.

In Madras and Punjab rain is wanted, but general prospects are satisfactory.

Numbers on test or relief: Madras, 395; Bombay, 2,805; Baroda, 5,002; United Provinces, 3,335; Ajmere and Rajputana, 30,014; total, 41,551.

QUESTIONS AND EXERCISES.

A 1. Explain exactly how differences of pressure, temperature and rainfall are shown in the upper two maps. For what periods are the isobars, isotherms and rainfall statistics given?

2. Explain the exact meaning of the tints and shadings used to show the various differences in vegetation and density of population in the lower two maps. How many towns are marked with over 100,000 people? (Those below 100,000 have a plain circle to mark their position.)

3. Make tracings of the two climatic maps, putting in the outline and isotherms in ink. Mark with solid ink the land area

over 96°, with diagonal ink lines the area between 88° and 96°, with solid pencil between 80° and 88°, with diagonal pencil lines between 72° and 80°, with dotted pencil lines between 64° and 72°, and leave the area with less than 64° white. Number all isotherms. (Or produce the same effect by tints.) Compare these with the Isotherm maps of the British Isles.

4. Produce two isobaric maps in the same way. Shade the whole area (land and sea) as follows: Over 30.3 in solid ink, between 30.1 and 30.3 with diagonal ink lines, between 29.9 and 30.1 in solid pencil, between 29.7 and 29.9 by diagonal pencil lines, between 29.5 and 29.7 by dotted pencil lines; below 29.5 leave white.

Number all isobars, and put in the arrows. (Or produce the same effect by tints.)

5. During what months is the cool season, the dry season, the hot season, the wet season, in Central India?

6. Describe and account for the seasonal distribution of rain in Ceylon.

7. What is the difference between the mean temperatures in January and July in lat. 29° N. long. 68° E., at Bombay (give nearest isotherm), at the extreme south of Ceylon.

8. What is the highest and lowest isobar marked on these maps? Why do the high isobars go with the low isotherms and vice versa?

9. Explain what is meant by monsoons. Give the physical causes which govern them, and show their result upon the distribution of rainfall at various seasons.

10. Where are the wettest and driest parts of India? Give reasons.

11. Account for the high population of the Ganges valley, the low population of the area east of the lower Indus.

B 1. Explain how the configuration of India and its position in the world govern its rainfall.

2. What are the most important crops of India? What conditions are necessary for each?

3. Make two tracings of the outline of India. Be ready to fill these in by memory as rainfall maps, one showing winter conditions, the other summer conditions.

4. Why is it that the isotherms are higher in the north than the south during July, whereas in January they get higher as they are nearer the equator?

5. Account for the difference in rainfall between the deltas of the Indus and Ganges. What result does this have upon vegetation?

6. In what parts of India are there still forests, and why?

7. Explain the conditions necessary for the growth of wheat and cotton, and show how they affect the distribution of these crops in India.

C 1. Very little of India is thinly populated. Account for this.

2. Explain the different systems of irrigation in India. Why is irrigation necessary in many of the districts which are marked as having sufficient rainfall in the maps?

3. Explain the reasons for the rainfall of Burma between November and May, and for the precipitation on the Himalayas during the same period.

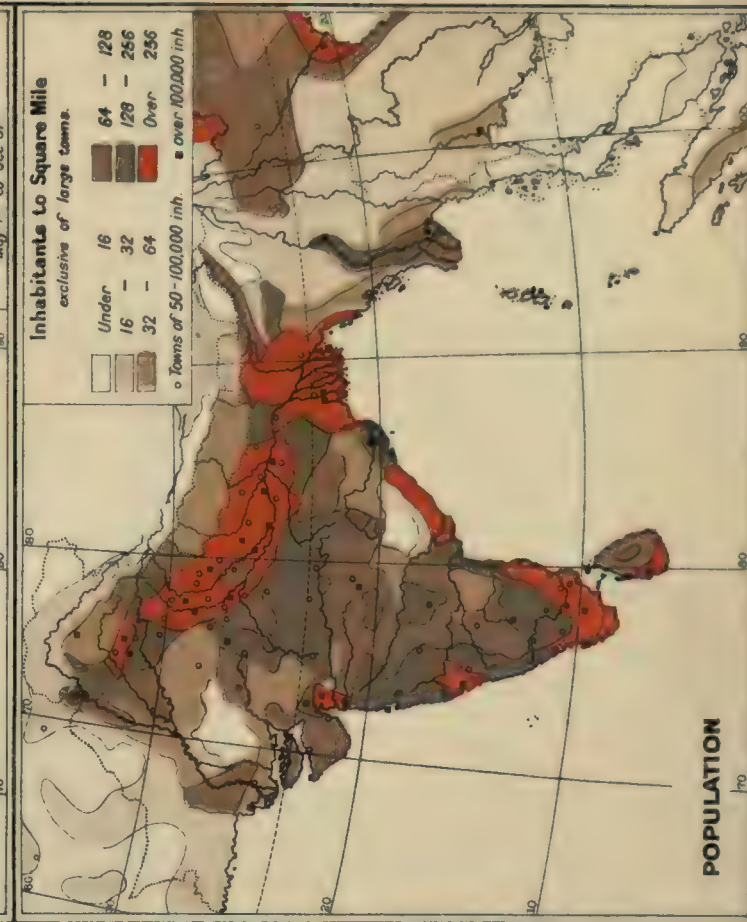
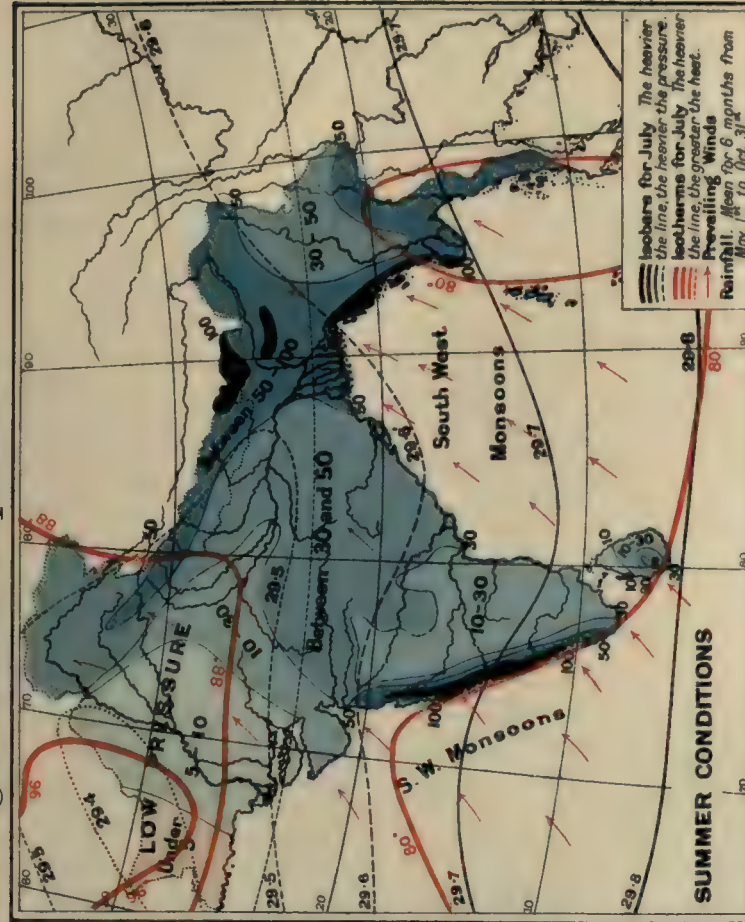
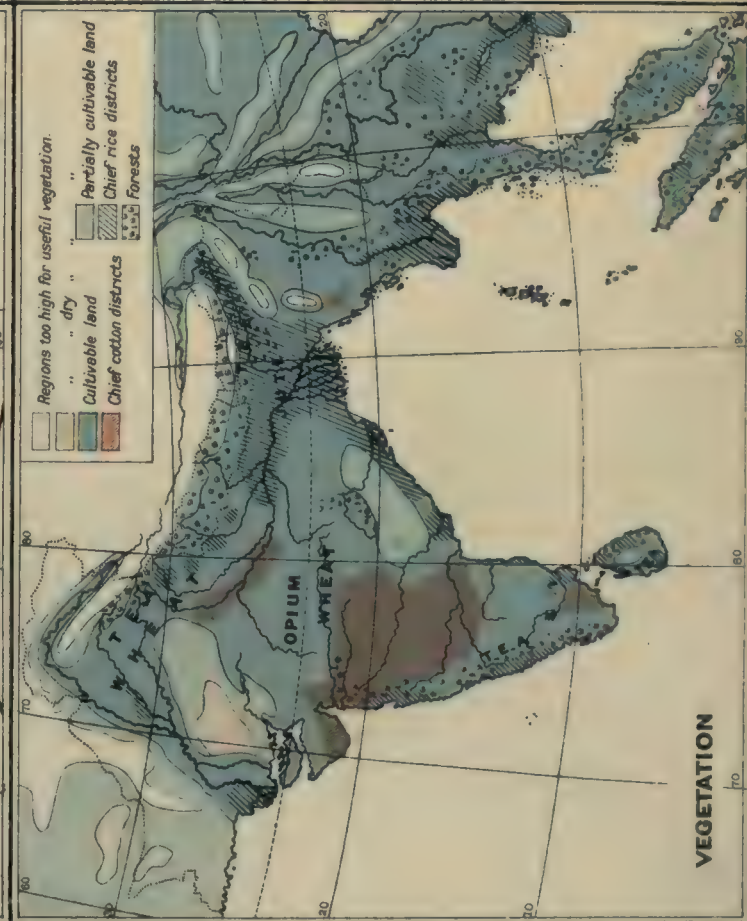
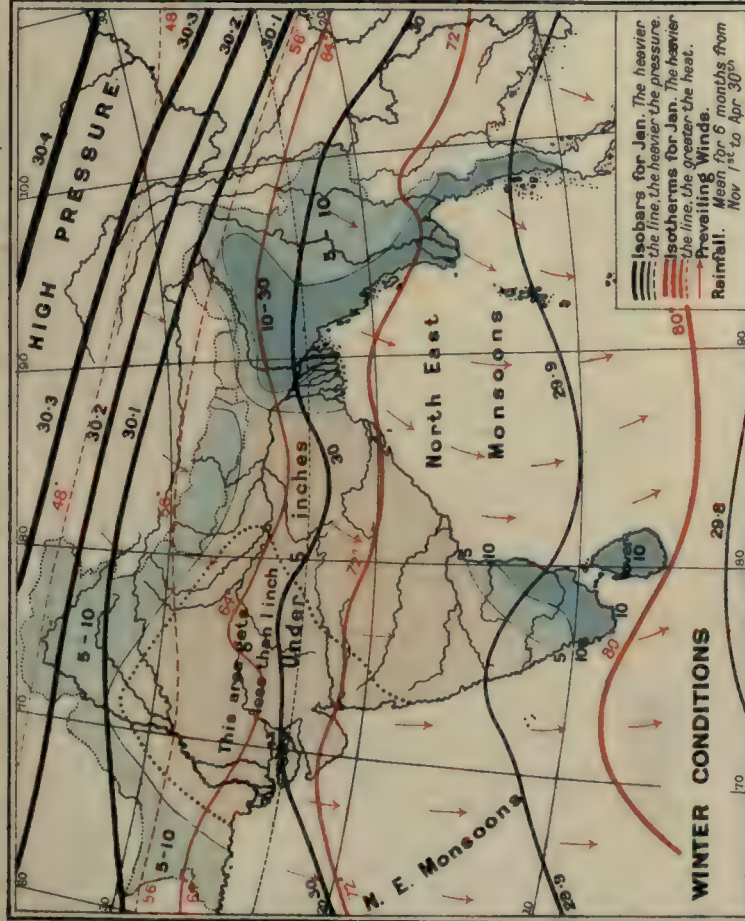
4. What other countries in the world are affected by somewhat similar climatic conditions?

5. Explain the great advantages of railways in counteracting Indian famines.

6. When would you expect the Indus to overflow? Why is the Ganges valley so much more densely peopled than most of the Indus valley?

7. Compare the mean January and July temperatures of Bombay, Colombo, Cawnpur, London, Peking, Moscow and the mouth of the Amazon. (See previous maps.)

INDIAN EMPIRE.—Climate, Vegetation & Population.



Industries, Communications and Trade.

Agricultural pursuits occupy the great majority of the people. There are, however, some coal mines of considerable value in Bengal where the coal-field is nearest to Calcutta. In Bombay large cotton-spinning mills are successfully worked, while in Calcutta much of the local jute is made up into rough cloth. There is of course a large mercantile population in the great seaports to handle the enormous export and import trade. The former is largely made up of such raw materials as rice (chiefly from Burma), raw cotton, wheat and jute; the latter of textile and metal manufactures.

Inland navigation along the great rivers of Northern India is naturally of much importance, though railways have destroyed much of this traffic. The Indus, with its rapid current, is almost deserted by steamers, now that a different means of transport is available. The Brahmaputra still provides the easiest route into Northern Assam.

The road and railway systems have been carefully planned and carried out by the Government authorities. In fact, no country in the world has been more scientifically treated in this respect.



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FIG. 172.—A TYPICAL COUNTRY ROAD IN CEYLON.

Notice the Buddhist Temple, the mode of conveyance, the evidences of great heat, the tropical vegetation, palms and banana-trees.

BThe Government have had three main reasons for their system of railway development: (1) strategical, (2) commercial, (3) the prevention of famines. Of the first, the lines going through the Bolan and Khaibar Passes are good instances. Troops could be landed at Karachi within a fortnight from Great Britain, and sent rapidly by rail to the northern frontier. The second and third motives have often acted jointly; the lines that traverse Central India between Bombay and Calcutta may be quoted as the most useful in both respects. Quick transport of food-stuffs or even the moving by rail of large numbers of the population have often prevented the disastrous effects of a failure of rain in any given district. Much of the relief work provided by Government, in times of drought, is spent on railway making, and in thus preventing future distress.

CThe value of Indian trade with the mother country can best be realised from Plate 20 and the tables given on page 48. As the commercial



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FIG. 173.—A TEMPLE IN CALCUTTA.

This is typical of much of the sacred architecture of India. The effect depends more upon the extreme elaboration of detail than upon bold outline. White marble is the material chiefly used in this building. Notice the wonderful intricacy of the carving. Contrast this with early Norman churches in England.

policy of the Indian Empire is guided by the Home Government, there is practically a system of free trade. The interchange of the cotton manufactures of Lancashire for the tea and rice and wheat of the Indian Empire and Ceylon is thus made easy and beneficial to both parts of the Empire.

The peculiar products of the highlands of Central Asia find their way to the plains of India through Kashmir and Sikkim, brought by yaks over the lofty passes of the Himalayas. The merchants of Tibet take in exchange the luxuries of India and the manufactures of Great Britain.

Similarly, a trade with Persia is carried on through the north-west of Baluchistan.



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FIG. 174.—A STREET IN COLOMBO.

This is typical of most of the towns in India also. Notice the humped cattle the usual beasts of burden, and the short shadows cast by the midday sun near the equator. Locate the place, and give its latitude. On the extreme left can be seen a "jinricksha," a method of conveyance borrowed from Japan.

QUESTIONS AND EXERCISES.

Physical.

- A** 1. How does the scale of this map compare with that of England and Wales on Plate 16? What is the exact meaning of the tints on the land?
2. Write a list, with symbols, of all mountains, peaks, rivers, passes, capes and parts of the sea (marked in brown). Be ready to repeat from Test Map.
3. Compare the height of Mount Everest (29,000 feet) with Mont Blanc and Ben Nevis.
4. Is it true to say that India has a splendid natural frontier to the north? What mountains help to form it?
5. Mention all the rivers on this map which have deltas. Give two instances of the ocean ports for great river valleys being situated away from the actual delta. Why is this? Compare Marseilles.

General.

6. What are the six ports marked here? What are the chief exports of each?
7. In a journey by train from Karachi via Delhi to Calcutta, what river valleys would be traversed, what towns (marked in brown) would be passed in order? Would any high ground be crossed?
8. Write a list, with symbols, of the towns (marked in brown); say in what countries they are, and upon what rivers (if any). Be ready to repeat from Test Map.
9. What ports are connected by steamer routes, as marked on this map? In a voyage to China from Suez, at which of these ports would a vessel probably call?
10. Are there any physical difficulties to be surmounted by the railways from Bombay to Calcutta, from Bombay to Madras? Why is Allahabad an important railway junction?
11. How have geographical considerations caused the growth of Bombay?
12. By what countries and seas is India bounded? Does Russian territory anywhere touch India? (See Political Map of Asia, Plate 39.)

Physical.

- B** 1. Write a list, with symbols, of all mountains, peaks, rivers, passes, capes and parts of the sea (marked in brown or blue). Be ready to repeat from Test Map.
2. Mention any cases where railway construction has had great natural difficulties to contend with.
- General.*
3. Write a list, with symbols, of all towns (marked in brown or blue). Be ready to repeat from Test Map.
4. What remains of French and Portuguese possessions are there in India?
5. In a journey by train from Trichinopoli to Calcutta, then on via Lucknow to the Khaibar Pass, and then to Karachi, what river valleys and towns would a traveller pass, in order?
6. In what parts of India are coal, precious stones and gold found? What are the two naval ports mentioned?
7. Is any desert mentioned here? Why is it impossible to apply irrigation to this desert region?

Physical.

- C** 1. Write a list, with symbols, of all the mountains, peaks, passes, rivers, capes, islands and parts of sea mentioned. Be ready to repeat from Test Map.
2. What special names are applied to various parts of the coast of India?
3. Explain why India is badly supplied with ports?
4. What is the value of the Gap of Coimbatore? What port owes its importance to it?

General.

5. Write a list, with symbols, of all towns mentioned. Be ready to repeat from Test Map.
6. Trace the map of India. Insert all the railways and name all towns upon them.
7. Discuss the importance of the railways leading through the Bolan and Khaibar passes. At what towns in Afghanistan do they point?



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FIG. 175.—PART OF SINGAPORE HARBOUR.

[Photocolor Co., Ltd.]

Give the latitude. Why is this place such an important trading station? How can you tell at once that the nearest steamer is for cargo and not for passenger traffic? Notice the houses built on piles, a very common custom in the Malay Archipelago. For what purpose are the sheds on the other side of the water?

INDIAN EMPIRE.



INDIAN EMPIRE.—Test.



| Explanation | |
|--------------|------------------------------|
| T1, T2, etc. | Towns in order of population |
| M1, M2 | Mountains |
| PL, P2 | Peaks |
| Pass 1 | Passes |
| R1, R2 | Rivers |
| AB | Parts of Sea |
| C1, C2 | Capes |
| I1, I2 | Countries connected by land |
| I1, I2 | Islands |



Scale 1:20,000,000 (316 miles=1 inch) 0 100 200 300 400 Statute Miles

Modified Conical Projection



FIG. 176.—PROVINCES AND NATIVE STATES OF INDIA.

(On the same scale as Plate 66.)

The numbers are arranged by order of population.
The names for A section are printed in heavy upright capitals.

QUESTIONS AND EXERCISES.

1. Name the foreign states which touch the Indian Empire. Nepal and Bhutan are protected states. Does the Russian Empire touch anywhere?
2. Write a list, with their symbols, in numerical order of all the divisions mentioned in your section.
3. Trace the map, putting in all the boundaries which mark off divisions in your section. Place this over the previous map and say in which division each town marked in brown lies. Put symbols instead of names, and bring up for use as a test map.
4. Which is the most populous province, which the most populous native state?

The names for B section are printed in light sloping capitals.

1. Write a list, with symbols, in numerical order, of all the divisions marked for A and B.
 2. Trace the map, putting in all the boundaries of the divisions named for A and B. Put symbols instead of names, and bring up for use as a test map.
 3. Superimpose the above tracing on the previous map of India and write down all towns (marked in brown or blue) according to their political divisions.
1. Repeat question B 1 for all divisions.
 2. Repeat question B 2, inserting all boundaries and symbols.
 3. Repeat question B 3, writing down names of all towns.

Outlying Tropical Dependencies.

Climate, Products and Trade.

A The maps opposite include all the British Colonies and possessions in the East and West Indies and a few others. As these are all of them either islands or else near the sea, and within the tropics, it is natural to suppose that copious rainfall is found in each, and therefore luxuriant vegetation. (See maps on Plates 3, 4 and 5.)

In nearly all there is naturally a free growth of tropical forests. Wherever this can be reached easily from navigable waters, there is a chance of a profitable timber industry. Hence comes the trade in mahogany and cabinet woods of the West Indies, and the teak of lower Burma (not in these maps).

In the forest regions near the equator, rubber—one of the most valuable products of the West African colonies—is now being cultivated in the Malay States, Borneo, Ceylon and British Guiana, and has become a very valuable article of export.

Most of the exports from these tropical dependencies, however, consist of the products of plantations, superintended by Europeans, and worked by races of men who are able to do severe manual labour in those climates. In the West Indies the descendants of African negro slaves are the chief labourers; in Malaysia and Borneo the labour of local peoples is supplemented by that of immigrant Chinese.

From the West Indies cane sugar is the most important item of export. British Guiana, Trinidad and Barbados are the most productive regions. Jamaica, which does the greatest total trade, exports about one million pounds value of bananas annually. Cocoa is also a valuable plantation crop throughout this region.

Singapore, besides acting as the collecting port for much of the products of the Malay States, also gets nearly all the transit trade of Sumatra, Java and Borneo. Most of the gutta-percha of commerce is here shipped, and tapioca is also a special product of this region. (It is made from the tuber of the manioc plant.)

The Malay peninsula also produces the great bulk of the tin used in the world. From Singapore alone over five million pounds' worth of this metal is sent annually to Great Britain. Hongkong is the greatest centre of traffic along the Chinese coast, and is among the four greatest ports of the world, according to the amount of tonnage cleared there. Its harbour and docks are excellent, and it is the headquarters of the British fleet in the China seas. It consists of an island and the adjoining peninsula, leased from China. Victoria is the name of the town on the island.

B In these colonies a large proportion of the total trade in what are known as "spices" is concentrated. For instance, nearly all the pepper used in Great Britain comes from Singapore, being grown in the surrounding region. Much of the ginger used in this country is sent from the West Indies or Singapore.

In the Straits Settlements and Malay States a valuable product called "gambier" is extracted from a shrub, and exported chiefly for tanning purposes.

Coffee has also been introduced there and in the West

Indies, but does not make up a large proportion of the total trade.

The gold produced in British Guiana reaches an annual value of nearly half a million pounds, and will probably be much more valuable in the future; but as yet its quantity is small compared with the output of South Africa, Australia and Canada.

C Among less important products of these dependencies may be mentioned the tobacco of Borneo, coal of Labuan, asphalt from the natural pitch-lake in Trinidad, sponges from the Bahamas, rum from the sugar of Jamaica, and copra from the Straits.

Of the six administrative groups into which the West Indies are divided, each has its Governor and Legislative Council appointed by the Crown, and generally a small Representative Assembly elected in the colony.

The Straits Settlements are governed in a similar way, but have no representative assembly.

The Malay States Perak, Selangor, Negri Sembilan and Pahang, were federated in 1896, and are governed by British officials through their native rulers. Great progress has been made of late years in the industrial development of this region, roads and railways have been constructed, and the tin mines thoroughly worked.

The official buildings of Kuala Lumpur (a town of about 80,000 inhabitants) are of an imposing character, and typify the permanence of British rule.

Near the extreme south of the peninsula the State of Johore is under the influence of Great Britain, as to its foreign relations.

The British North Borneo Company manages the territory of that name, as well as Labuan. Brunei is a protected native state under its own Sultan.

Sarawak was obtained from the Sultan of Brunei, and has been since governed by members of the English family of Brooke, under the title of Rajah.

QUESTIONS AND EXERCISES.

- A** 1. Write a list, with symbols, of the six administrative divisions of the British West India Islands. Give the capital of Jamaica. Be ready to repeat from the Test Map.
2. Write down the names, with symbols, of the British possessions on the mainland of America (in this map). Name the capital of British Guiana.
3. Compare, roughly, in area British Guiana with England and Wales, British Honduras with Wales, Trinidad with Kent, British North Borneo with England, Singapore Island with the Isle of Wight (say "about the same size," "rather smaller than," and so on).
4. Near what other political divisions are Jamaica, Straits Settlements, Hongkong, British North Borneo, the Bahamas, Trinidad, British Guiana, British Honduras? What other nations, besides the British, have insular possessions in the West Indies and in the East Indies?
5. Write a list, with symbols, of the administrative divisions (belonging to Great Britain), with any towns marked in brown in the lower map. Be ready to repeat from the Test Map.
6. Taking a degree of latitude as equal to 70 miles, estimate the distance from Isthmus of Panama to Kingston, from Labuan to Hongkong. How many miles across are the Straits of Malacca at their narrowest point?
7. Do any of the British possessions in these two maps extend outside the tropics. Which is the nearest to the equator?
8. Give the latitude to nearest degree of Kingston, Hongkong, Khartum, Bombay, Brisbane, Rio de Janeiro and London.

OUTLYING TROPICAL DEPENDENCIES.—General.

68



Modified Conical Projection

Scale 1:20,000,000 (3 1/16 miles = 1 inch) 0 100 200 300 400 Statute Miles

9. Using the Isotherm maps in Part IV, compare the July and January temperatures of Kingston (Jamaica) with those of New York, Winnipeg and Vancouver Island.

10. How does the mean annual rainfall of London compare with that of Jamaica and Singapore? (See previous maps.)

11. Write down the exports, marked in the maps, from British North Borneo, Georgetown, Trinidad, Barbados, Leeward and Windward Islands, British Honduras, the Bahamas, Hongkong and Singapore.

B 1. Write a list, with symbols, of all political divisions and towns mentioned in blue or brown in these two maps (not those in brackets). Be ready to repeat from Test Map.

2. What sea routes concentrate on Singapore? Why is it a natural place for a naval station?

3. From which of these colonies are minerals exported?

4. Which of these possessions would you expect to receive least rainfall; which most?

5. Are there very marked seasons in Sarawak? Does the daylight vary much in length between winter and summer?

C 1. Write a list, with symbols, of all political divisions and towns marked in these two maps (not those in brackets).

Be ready to repeat from the Test Map. Name a mountain and a river in British Guiana.

2. Write down a political division in South America, Africa and Asia, which is passed through by lat. 5° N.

3. How many miles, roughly, from the pole and the equator are Hongkong, Georgetown, Kingston, Singapore, Belize?

4. What are the Federated Malay States? Name the largest town in them?

5. From what places are steamer routes marked to Hongkong, Singapore, Labuan, Havana, St. Thomas, Georgetown.

6. Give the capital town of Jamaica, Trinidad, British Guiana, British Honduras, Barbados, British North Borneo, Sarawak, Selangor and Hongkong.

7. In what ways have the Sugar Convention and subsidised steamship lines helped the trade of the West Indies?

8. What naval ports are marked on these maps? To what nations do they belong? Discuss their importance.

Certain Possessions not in Special Maps.

C Gibraltar, Malta and Aden are chiefly of importance for strategical reasons. They are all very much used by merchant vessels as ports of call, often for coaling purposes. Malta has, besides transit trade, a fairly important export of native products, such as wheat, potatoes, and oranges. Give lat. and long. of each from Plate 8. How wide, roughly, is the strait of Gibraltar? Would this fortress be of the least use to Great Britain, apart from the fleet?

Cyprus, taken by agreement from Turkey, produces similar agricultural products to those of the coast of Asia Minor, wheat and wine being the most characteristic. How far is Cyprus from Alexandria? Compare the island in size with the Isle of Wight, Ireland, and Corsica.

Mauritius has an important sugar industry, the labour for which is chiefly supplied by coolies from India. The French had developed the island previously to the British capture in 1810. Locate the island on Plate 8. What other British possessions are in about the same latitude?

Fiji consists of a group of mountainous islands, with a typical oceanic inter-tropical climate. The regular rainfall from the trade winds on the windward slopes enables cane sugar and copra to be successfully produced. Give the difference in time between Fiji and London. Which is the drier side of these islands?

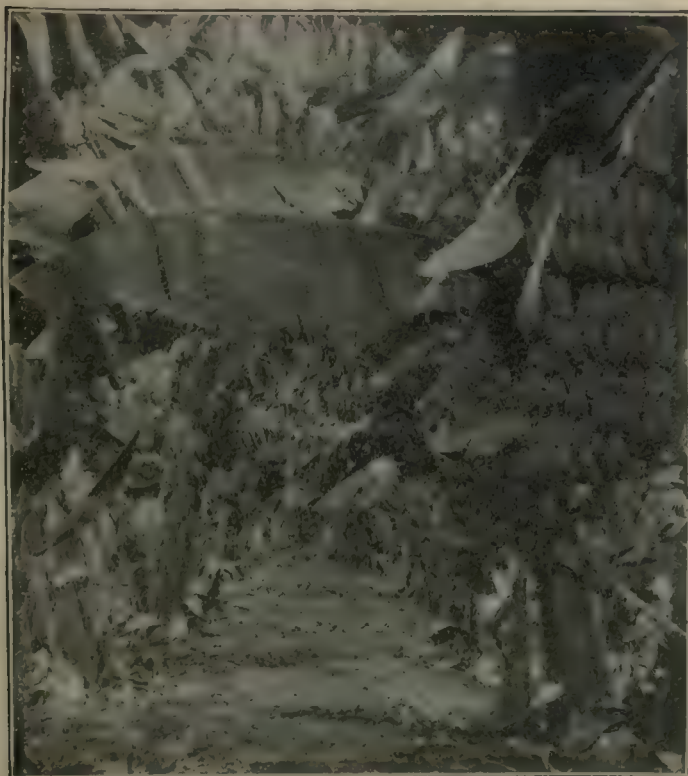
The Falkland Isles are gradually developing a remunerative industry from sheep-farming. How far are they from the South Pole?

The Bahrein Islands are ruled by a native chief, under British protection. They are the centre of the valuable pearl "fishery" of the Persian Gulf. From what other parts of the world do pearls come?

The Bermuda Islands, famous as the scene of Shakespeare's *Tempest*, owe their importance to their strategical position. They are composed of coral reefs (the farthest coral formation from the equator; what phenomenon makes this possible?)—and owing to the intricate approaches to the excellent naval harbour and dockyard, are very easily defended. Locate them, give the latitude and longitude, estimate their distance from the American coast, and consider what their value would be, as a naval base, in case of that almost inconceivable event, a war between Great Britain and the United States.

The Seychelles, like Mauritius, were first developed by the French. Their chief products are cocoanut oil and vanilla. Locate them, give latitude and longitude, and estimate their distance from Aden, Mauritius and Bombay. What would you expect to be their climate, winds and rainfall?

The Tonga or Friendly Islands, a British Protectorate since 1899, resemble Fiji in climate and products. Copra is the only important export. Give their latitude and longitude and distance, roughly, from Fiji, Australia and New Zealand. In what wind system are they? Which side of these islands must receive most rainfall?



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FIG. 177.—TROPICAL VEGETATION.

▲ banana grove near Havana. Locate the place in the map and give latitude. Notice the way in which the fruit grows. No other plant produces so much fruit per acre.

REVISION QUESTIONS.

- A** 1. What bonds or common privileges unite the various parts of the British Empire ?
2. What European nations have been foremost as colonising nations at various times ? Can you give geographical reasons ?
3. In what parts of the world have France and Great Britain come into conflict, owing to colonial interests ?
4. Give a short historical account of the steps which have led to the gradual building up of the Empire.
5. Compare the climatic conditions of Australia and South Africa. Have these led to similar products ?
6. Why are the rivers of South Africa and Australasia generally useless for navigation ? How far have railways supplied the necessary means of transport ?
7. Compare Canada, Australia and the Indian Empire as to area, population and latitude.
8. Into what natural divisions can India be divided ?
9. Compare the coasts of India, Cape Colony, Australia, New Zealand and Canada as to their natural harbours.
10. Explain the Indian monsoons. What is their effect on rainfall and vegetation ?
11. Compare the climate and products of the West Indies and British Malaysia.
- B** 1. Into what classes can the various units in the British Empire be divided, according to their method of government ? Give instances in each case.
2. Compare the relative value of the various mineral products of South Africa and Australasia.

3. Give an account of the history and development of the West African colonies.
4. Describe the surface of Canada. What geological conditions are of importance to its agriculture ?
5. Give some account of the means of communication in Canada.
6. What are the chief industries of Canada ? How far are they controlled by climatic conditions ?

- C** 1. Give some account of the means taken to ensure Imperial defence.
2. Give an account of any peculiar products of New Zealand, Western Australia, Cape Colony.
3. Write a short history of the development of Australasia.
4. What obstacles are there to the free navigation of the St. Lawrence and the great lakes ? Account for the position of the chief lake and river ports ?
5. Write a short historical geography of the Indian Empire.
6. What are the chief vegetable products of India ? How are these distributed geographically ? Give names.
7. From Plate 20 write a list of the chief colonial imports into Great Britain, with their approximate value (where possible).
8. Under a system of free trade within the Empire, can you imagine any commercial disadvantages to any part of the Empire ?
9. Make a tracing of the outline of the world from Plate 1. Fill in the names of all imperial dockyards and coaling stations, underlining those which are fortified. Add the chief cables from Plate 8.

Index of Names on the Coloured Plates.

N.B.—(1) Each name is referred to by the number of the Plate, where it is best shown. The nearest point of intersection of lines of latitude and longitude (as marked on the plate referred to) is then given, with the bearing from that point. Thus "Agra . 66 25 80, s.w." means that on Plate 66 Agra will be found north-west of the point where latitude 25 is cut by longitude 80.

(2) The larger geographical divisions are printed in heavy type.

(3) Chief abbreviations used :—

| C. = Cape.
F. = Firth. | | | | G. = Gulf.
I. = Island. | | | | Is. = Islands.
L. = Lake. | | | | Mt. = Mountain.
Pk. = Peak. | | | | Plat. = Plateau.
Pt. = Point. | | | |
|---------------------------|----------|------|-------|----------------------------|------------------------|----------|------|------------------------------|---------|------------------------|----------|--------------------------------|-------|---------|--|----------------------------------|------|-------|---------|
| | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing |
| AAR, R. | 30 | 46 | 8 | N.W. | Antilles, Lesser | 47 | 20N | 60 | S | Baltimore | 43 | 40 | 75 | S.W. | | 43 | 40 | 75 | S.W. |
| Aarhus | 23 | 60 | 10 | ■ | Antipodes Is. | 6 | 50s | 180 | — | Baluchistan | 39 | 30 | 70 | S.W. | | 39 | 30 | 70 | S.W. |
| Abeokuta | 61 inset | | | | Antofagasta | 52 | 20s | 70 | S | Banff | 18 | 57 | ■ | N | | 18 | 57 | ■ | N |
| Aberdeen | 18 | 57 | 2 | N.W. | Antrim | 18 | 55 | ■ | S | Bangalore | 66 | 15 | 75 | S.E. | | 66 | 15 | 75 | S.E. |
| Abyssinia | 54 | 10N | 40 | — | Antwerp | 30 | 52 | 4 | S.E. | Bangkok | 39 | 10 | 100 | ■ | | 39 | 10 | 100 | ■ |
| Accra | 61 inset | | | | Apennine Mts. | 32 | 42 | 14 | — | Bangor | 16 | 53 | 4 | N | | 16 | 53 | 4 | N |
| Achill, I. | 10 | 54 | 10 | — | Apulia | 32 | 40 | 18 | N.W. | Bangweolo, L. | 47 | 10s | ■ | — | | 47 | 10s | ■ | — |
| Aconcagua, Mt. | 47 | 30 | 70 | S | Arabia | 39 | 20 | 50 | N.W. | Bann, R. | 10 | 56 | ■ | S | | 10 | 56 | ■ | S |
| Addis Abeba | 54 | 10N | 40 | S.W. | Aragon | 28 | 42 | 0 | S.W. | Bantry Bay | 10 | 51½ | 10 | — | | 10 | 51½ | 10 | — |
| Adelaide | 59 | 35 | 140 | W | Aral, L. | 34 | 40 | 60E | N | Barbados I. | 68 | 15 | 60 | S.E. | | 68 | 15 | 60 | S.E. |
| Aden | 39 | 10 | 50 | N.W. | Ararat, Mt. | 34 | 40 | 40E | E | Barcelona | 28 | 42 | 2E | ■ | | 28 | 42 | 2E | ■ |
| Adige R. | 32 | 46 | 12 | S | Aravalli Hills | 66 | 25 | 75 | N.W. | Bareilly | 66 | 30 | ■ | ■ | | 66 | 30 | ■ | ■ |
| Adirondack Mts. | 43 | 45 | 75 | S.E. | Archangel | 23 | 60 | 40 | N | Bari | 32 | 42 | 18 | S.W. | | 32 | 42 | 18 | S.W. |
| Adour R. | 28 | 44 | ■ | S.W. | Ardenne, Mts. | 28 | 50 | 6E | W | Barka | 47 | 30N | 20E | ■ | | 47 | 30N | 20E | ■ |
| Adrianople | 32 | 42 | 26 | S.E. | Arequipa | 52 | 20s | 70 | N.W. | Barmen | 30 | 52 | 8 | S.W. | | 30 | 52 | 8 | S.W. |
| Adriatic Sea | 32 | 44 | 14 | — | Argentina | 52 | 30s | 60 | S.W. | Barmouth | 16 | 53 | 4 | ■ | | 16 | 53 | 4 | ■ |
| Aegean Sea | 32 | 38 | 26 | W | Argyll | 18 | 56 | 5 | N.W. | Baroda | 66 | 20 | 75 | N.W. | | 66 | 20 | 75 | N.W. |
| Afghanistan | 39 | 30 | 60 | N.E. | Arizona | 43 | 35 | 110 | S.W. | Barrage | 54 inset | | | | | 54 inset | | | |
| Agra | 66 | 25 | 80 | N.W. | Arkansas, R. | 34 | 40 | 100W | S.E. | Barranquilla | 52 | 10N | 80 | N.E. | | 52 | 10N | 80 | N.E. |
| Agram | 30 | 46 | 16 | ■ | Arkansas | 43 | 35 | 90 | W | Barrier Reef | 59 | 15 | 145 | E | | 59 | 15 | 145 | E |
| Agulhas, C. | 61 | 30 | 20 | ■ | Armagh | 18 | 54 | 7 | ■ | Barrow | 16 | 54 | 3 | N.W. | | 16 | 54 | 3 | N.W. |
| Ahmadabad | 66 | 25 | 75 | S.W. | Armenia | 23 | 40 | 40 | ■ | Barrow, C. | 34 | 70 | 150W | N | | 34 | 70 | 150W | N |
| Aire, R. | 10 | 54 | ■ | — | Arnhem | 30 | 52 | 6 | — | Barrow, R. | 10 | 52 | 6 | N.W. | | 10 | 52 | 6 | N.W. |
| Aix la Chapelle | 30 | 50 | 8 | N.W. | Arnhem's Land | 59 | 15 | 135 | N.W. | Basle | 30 | 48 | ■ | S.W. | | 30 | 48 | ■ | S.W. |
| Ajaccio | 28 inset | | | | Arno R. | 32 | 44 | 10 | S.E. | Basque, prov. | 28 | 44 | 2W | ■ | | 28 | 44 | 2W | ■ |
| Ajnere | 68 | 25 | 75 | ■ | Arran, I. | 10 | 56 | 6 | S.E. | Basra | 39 | 30 | 50 | ■ | | 39 | 30 | 50 | ■ |
| Akassa | 61 inset | | | | Asaba | 61 inset | | | | Bass Str. | 59 | 40 | 145 | — | | 59 | 40 | 145 | — |
| Alabama | 43 | 35 | 85 | S.W. | Ascension, I. | 8 | 10s | 20W | — | Basuto Land | 61 | 30 | 30 | ■ | | 61 | 30 | 30 | ■ |
| Alais | 28 | 44 | 4E | — | Ashanti | 61 inset | | | | Batavia | 39 | 10 | 110 | N.W. | | 39 | 10 | 110 | N.W. |
| Alaska | 41 | 60 | 150 | N | Assiut | 54 inset | | | | Bath | 16 | 51 | 2 | N.W. | | 16 | 51 | 2 | N.W. |
| Albania | 32 | 42 | 20 | ■ | Assuan | 54 inset | | | | Bathurst, Gambia | 61 inset | | | | | 61 inset | | | |
| Albany, U.S.A. | 43 | 45 | 75 | S.E. | Aston Manor | 16 | 52 | 2 | N.E. | Bathurst, New S. Wales | 59 | 35 | 150 | N | | 59 | 35 | 150 | N |
| Albany, Australia | 59 | 36 | 120 | W | Astrakhan | 23 | 50 | 30 | S.W. | Batum | 23 | 40 | 40 | N.E. | | 23 | 40 | 40 | N.E. |
| Albert Edward, L. | 61 | 0 | 30 | — | Asturias | 28 | 44 | 6W | S | Bay of Islands | 59 inset | | | | | 59 inset | | | |
| Albert, L. | 61 | 0 | 30 | N.E. | Asuncion | 52 | 30 | 60 | N.E. | Beachy Hd. | 10 | 51½ | 0 | ■ | | 10 | 51½ | 0 | ■ |
| Alberta | 63 | 50 | 110 | N.W. | Atacama Desert | 47 | 20s | 70 | S | Bechuanaland | 61 | 25 | 25 | N | | 61 | 25 | 25 | N |
| Albury | 59 | 35 | 145 | S.E. | Atbara, R. | 47 | 20N | 40 | S.W. | Bedford | 16 | 52 | 0 | N.W. | | 16 | 52 | 0 | N.W. |
| Alderney | 28 | 50 | 2W | S.W. | Athabasca, L. | 63 | 60 | 110 | S.E. | Beira | 61 | 20 | 35 | — | | 61 | 20 | 35 | — |
| Aldershot | 16 | 51 | 1W | N | Athens | 32 | 38 | 24 | — | Beirut | 39 | 30 | 40 | N.W. | | 39 | 30 | 40 | N.W. |
| Aleppo | 39 | 40 | 40 | S.W. | Atlas Mts. | 47 | 30N | ■ | N.W. | Belfast | 18 | 55 | ■ | S | | 18 | 55 | ■ | S |
| Alessandria | 32 | 44 | 8 | N.E. | Auckland | 59 inset | | | | Belfast, L. | 10 | 54 | ■ | N | | 10 | 54 | ■ | N |
| Alexandria | 54 inset | | | | Augsbuurg | 30 | 48 | 10 | N.E. | Belfort | 28 | 48 | 6E | S.E. | | 28 | 48 | 6E | S.E. |
| Algeria | 54 | 30 | ■ | N.E. | Australia | 59 | — | — | — | Belgrade | 32 | 44 | 20 | N.E. | | 32 | 44 | 20 | N.E. |
| Algiers | 54 | 40 | ■ | S.E. | Australian Alps | 59 | 35 | 150 | S.W. | Belize | 68 | 20 | 85 | S.W. | | 68 | 20 | 85 | S.W. |
| Algoa B. | 61 | 30 | 25 | S.E. | Australian B., Gt. | 59 | 35 | 130 | N | Belle I. | 28 | 48 | 4W | S.E. | | 28 | 48 | 4W | S.E. |
| Alicante | 28 | 38 | 0 | N.W. | Austria Hungary | 30 | — | — | — | Belle Isle Str. | 63 | 50 | 50 | N.W. | | 63 | 50 | 50 | N.W. |
| Allahabad | 66 | 25 | 80 | N.E. | Auvergne Mts. | 28 | 46 | 2E | ■ | Ben Macdhui | 10 | 56 | 4 | N | | 10 | 56 | 4 | N |
| Alleghany Plateau | 43 | 40 | 80 | S.E. | Avignon | 28 | 44 | 4E | E | Ben Nevis | 10 | 56 | 4 | N.W. | | 10 | 56 | 4 | N.W. |
| Allier R. | 28 | 46 | 4E | S.W. | Avon, R. | 10 | 51½ | 2 | ■ | Ben Wyvis | 10 | 58 | 6 | S.E. | | 10 | 58 | 6 | S.E. |
| Almeria | 28 | 38 | 2W | N.W. | Avon, R. | 10 | 51½ | 2 | ■ | Benares | 66 | 25 | 85 | W | | 66 | 25 | 85 | W |
| Alt R. | 30 | 46 | 24 | S.E. | Avon, R. | 10 | 52 | 2 | N | Bendigo | 59 | 35 | 145 | S.W. | | 59 | 35 | 145 | S.W. |
| Altai Mts. | 34 | 50 | 90E | ■ | Aylesbury | 16 | 52 | 1W | ■ | Bengal, B. of | 66 | 20 | ■ | ■ | | 66 | 20 | ■ | ■ |
| Altona | 30 | 54 | 10 | ■ | Ayr | 18 | 55 | 5 | N.E. | Benguela | 54 | 10s | 10W | ■ | | 54 | 10s | 10W | ■ |
| Amadeus, L. | 59 | 25 | 130 | N.E. | Azof | 21 | 50 | 40 | S.W. | Benin | 61 inset | | | | | 61 inset | | | |
| Amazon R. | 47 | 0 | 50 | W | Azores | 8 | 40N | 30W | — | Benue, R. | 61 inset | | | | | 61 inset | | | |
| Amiens | 28 | 50 | 2E | — | | | | | | Berber | 54 | 20N | 30E | S.E. | | 54 | 20N | 30E | S.E. |
| Amoy | 55 | 25 | 120 | S.E. | BAB EL MAN- | | | | | Bergen | 23 | 60 | 0 | ■ | | 23 | 60 | 0 | ■ |
| Amritsar | 66 | 30 | 75 | N | DEB, STR. | 34 | 10 | 40E | N.E. | Bering Sea | 34 | 60 | 170W | N | | 34 | 60 | 170W | N |
| Amsterdam | 30 | 52 | ■ | N.E. | Baffin Bay | 63 | 70 | 70 | N.E. | Bering Str. | 34 | 70 | 170W | ■ | | 34 | 70 | 170W | ■ |
| Amu R. | 34 | 40 | 70E | S.W. | Baffin Land | 63 | 70 | 70 | S.W. | Berkshire | 16 | 51 | 1W | N | | 16 | 51 | 1W | N |
| Amur R. | 34 | 50 | 130E | — | Baghdad | 39 | 30 | 50 | N.W. | Berlin | 30 | 52 | 14 | N.W. | | 30 | 52 | 14 | N.W. |
| Ancona | 32 | 44 | 14 | S.W. | Bahama Is. | 68 | 25 | 75 | — | Bermudas, I. | 8 | 30N | 60W | — | | 8 | 30N | 60W | — |
| Andalusia | 28 | 38 | 4W | S.W. | Bahia | 52 | 10s | 40 | S.E. | Berne | 30 | 46 | ■ | N.W. | | 30 | 46 | ■ | N.W. |
| Andaman Is. | 66 | 10 | 90 | N.E. | Bahia Blanca | 52 | 40 | 60 | N.W. | Berwick | 18 | 56 | 2 | S.W. | | 18 | 56 | 2 | S.W. |
| Andes, Mts. | 47 | 0 | 80 | ■ | Bahrein Is. | 39 | 30 | 50 | S | Berwick-on-Tweed | 16 | 56 | ■ | S | | 16 | 56 | ■ | S |
| Andorra | 28 | 42 | 2E | N.W. | Bahr el Ghazal | 54 | 10N | 30 | S.W. | Berwyn Mts. | 10 | 52 | ■ | N | | 10 | 52 | ■ | N |
| Angara R. | 34 | 60 | 100E | S.E. | Bahr el Ghazal, R. | 47 | 10N | 30 | S.W. | Bessarabia | 23 | 50 | 50 | S.W. | | 23 | 50 | 50 | S.W. |
| Anglesey | 10 | 54 | 4 | ■ | Baikal, L. | 34 | 50 | 110E | N | Bharno | 66 | 25 | 95 | S.E. | | 66 | 25 | 95 | S.E. |
| Angola | 54 | 20s | 20E | N.W. | Baku | 23 | 40 | 50 | — | Bhopal | 66 | 25 | 75 | S.E. | | 66 | 25 | 75 | S.E. |
| Anjou | 28 | 48 | 0 | ■ | Bala, L. | 16 | 53 | ■ | ■ | Bhutan | 66 | 30 | 90 | ■ | | 66 | 30 | 90 | ■ |
| Annam | 39 | 20 | 110 | S.W. | Baleaic Is. | 28 | 40 | 2E | — | Blarritz | 28 | 44 | 2W | S.E. | | 28 | 44 | 2W | S.E. |
| Antananarivo | 54 | 20s | 50 | N.W. | Balkans, Mts. | 32 | 42 | 24 | N.E. | Bilbao | 28 | 44 | 2W | N.W. | | 28 | 44 | 2W | N.W. |
| Antarctica | 6 | — | — | — | Balkash, L. | 34 | 50 | 80E | S.W. | Birkenhead | 16 | 53 | 3 | N | | 16 | 53 | 3 | N |
| Anticosti, I. | 63 | 50 | 60 | S.W. | Ballarat | 59 | 30 | 145 | N.W. | Birmingham | 16 | 53 | ■ | ■ | | 16 | 53 | ■ | ■ |
| Antigua, I. | 68 | 15 | 60 | N.E. | Balmoral | 18 | 57 | 8 | — | Biscay, B. of | 21 | 50 | 10W | S.E. | | 21 | 50 | 10W | S.E. |
| Antilles, Greater | 47 | 20N | 80 | ■ | Baltic Sea | 21 | 60 | 20 | ■ | Biskra | 54 | 30N | 10E | S.W. | | 54 | 30N | 10E | S.W. |

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|-------------------------------|-------|------------|-------|---------|-----------------------------|-------|-------|-------|---------|-----------------------------------|-------|-------|-------|---------|
| Bizerta | 54 | 40 | 10E | S | Buxton | 16 | 53 | 2 | N | Chichester | 16 | 51 | 1W | S.E. |
| Bitola | 32 | 42 | 22 | S.W. | Byron, C. | 59 | 30 | 155 | N.W. | Chifu | 45 | 35 | 120 | N.E. |
| Black Dome Mt., United States | 43 | 35 | 80 | N.W. | CABOT STR. | 63 | 50 | 80 | ■ | Chile | 52 | 30 | 70 | — |
| Black Forest | 30 | 48 | 8 | N.E. | Cader Idris | 10 | 52 | 4 | N | Chiltern Hills | 10 | 51½ | 0 | N.W. |
| Blackpool | 16 | 54 | 3 | ■ | Caliz | 28 | 36 | 6W | N.W. | Chimborazo, Mt. | 47 | 0 | 80 | S |
| Black Sea | 21 | 40 | 30 | N.E. | Cagliari | 32 | 40 | 10 | S.W. | China | 45 | — | — | — |
| Blackburn | 16 | 54 | 3 | S.E. | Caño | 54 | inset | — | — | Chinde | 54 | 20s | 40 | N.W. |
| Blackwater, R. | 10 | 52 | 8 | — | Canthness | 18 | 58 | ■ | N.W. | Ching-tu | 45 | 30 | 105 | N.W. |
| Blanc, Mt. | 28 | 46 | 0E | E | Calabria | 32 | 38 | 16 | N | Chios, I. | 32 | 38 | 26 | N |
| Blanco, C. | 47 | 30N | 10E | N | Calnis | 28 | 50 | 2E | N | Chita | 39 | 50 | 110 | N.E. |
| Blantyre | 61 | 15 | 35 | S.E. | Calcutta | 66 | 25 | 90 | S.W. | Chitral | 66 | 35 | 70 | N.E. |
| Bloemfontein | 61 | 30 | 25 | N.E. | Calgary | 63 | 50 | 110 | N.W. | Chonos Arch. | 47 | inset | — | — |
| Blue Mts. | 59 | 150 | 35 | N.E. | Calicut | 66 | 10 | 75 | N.E. | Christchurch | 59 | inset | — | — |
| Blue Nile | 47 | 10N | 30 | N.E. | California, G. of | 34 | 30 | 110W | S.W. | Christiania | 23 | 60 | 10 | — |
| Bodmin | 13 | (rainfall) | — | — | California | 43 | 35 | 120 | N | Chudleigh, C. | 63 | 60 | 60 | W |
| Bodmin Moor | 10 | 50 | 4 | N.W. | Callao | 52 | 10s | 80 | S.E. | Chung-king | 45 | 30 | 105 | S.E. |
| Bogota | 52 | 0 | 70 | N.W. | Camara, Pk. | 47 | 0 | 10E | ■ | Churchill, R. | 63 | 60 | 100 | S.W. |
| Bohemia | 30 | 50 | 14 | — | Camara, St. | 54 | 0 | 10E | N.E. | Cincinnati | 43 | 40 | 85 | S.E. |
| Bohemian Forest | 30 | 50 | 14 | S.W. | Cambay, G. of | 66 | 20 | 70 | N.E. | Civitavecchia | 32 | 42 | 12 | — |
| Bokhara | 39 | 40 | 60 | ■ | Cambodia | 39 | 10 | 100 | N.E. | Clackmannan | 18 | 56 | 4 | N.E. |
| Bolan P. | 66 | 30 | 65 | ■ | Cambrian Mts. | 10 | 52 | 4 | — | Clare | 18 | 53 | ■ | S |
| Bolivia | 52 | 20s | 60 | N.W. | Cambridge | 16 | 52 | 0 | N.E. | Clarence R. | 59 | 30 | 150 | N.E. |
| Bologna | 30 | 44 | 12 | N.W. | Cambridge, G. | 59 | 15 | 130 | N.W. | Clear, C. | 10 | 51½ | 16 | — |
| Bolton | 16 | 54 | 3 | S.E. | Canada, Dom. of | 63 | — | — | — | Cleveland | 43 | 40 | 80 | N.W. |
| Boma | 54 | 10s | 10E | N.E. | Canary Is. | 8 | 30W | 20W | — | Clutha, R. | 59 | inset | — | — |
| Bombay | 66 | 20 | 70 | S.E. | Candia | 32 | 38 | 26 | S.W. | Clyde, F. of | 10 | 56 | ■ | S.W. |
| Bone | 54 | 40 | 10E | S.W. | Cannes | 28 | 44 | 6E | S.E. | Clyde, R. | 10 | 56 | ■ | S |
| Bonifacio, Str. of | 32 | 42 | 10 | S.W. | Cantabrian Mts. | 28 | 44 | 6W | S | Coblentz | 30 | 50 | ■ | N.W. |
| Bordenux | 28 | 44 | 0 | N.W. | Canterbury | 16 | 51 | 1E | N | Cochin China | 39 | 10 | 100 | ■ |
| Borneo, Br. N. | 68 | 5 | 115 | ■ | Canterbury Plains | 59 | inset | — | — | Cod, C. | 34 | 40 | 70 | N |
| Borneo, I. | 39 | 0 | 110 | E | Canton | 45 | 25 | 115 | S.W. | Coimbra | 28 | 40 | 8W | N.W. |
| Bosnia | 30 | 44 | 18 | ■ | Cape Breton I. | 63 | 50 | 60 | S | Colchester | 16 | 52 | 1E | S |
| Bosporus, Str. | 32 | 42 | 28 | ■ | Cape Coast Castle | 61 | inset | — | — | Cologne | 30 | 50 | ■ | N.E. |
| Boston | 43 | 40 | 70 | N | Cape Colony | 61 | 30 | 25 | S | Colombia | 52 | 0 | 70 | N.W. |
| Batavia, G. of | 21 | 60 | 20 | N | Cape Town | 61 | 30 | 20 | S.W. | Colombo | 66 | 5 | 80 | ■ |
| Boulogne | 28 | 50 | 2E | N.W. | Cape Verde Is. | 8 | 20N | 30W | — | Colon | 52 | 10 | 80 | — |
| Bourke | 59 | 30 | 145 | ■ | Cape York Pen. | 59 | 15 | 145 | N.W. | Colorado Plat. | 34 | 30 | 110W | N |
| Bournemouth | 16 | 51 | 2 | ■ | Caracas | 52 | 10N | 70 | ■ | Colorado, R., Argentina | 47 | 40 | 70 | N.E. |
| Boyne, R. | 10 | 54 | 6 | — | Cardanum Hills | 66 | 10 | 75 | E | Colorado, R., N. Am. | 34 | 40 | 110W | S.W. |
| Bradford | 16 | 54 | 2 | S.E. | Cardiff | 16 | 52° | 3° | ■ | Colorado | 43 | 40 | 105 | ■ |
| Brahmaputra | 66 | 25 | 90 | N.E. | Cardigan | 16 | 52 | 4 | ■ | Columbia Plat. | 34 | 50 | 120W | S.E. |
| Braia | 32 | 46 | 28 | ■ | Cardigan Bay | 10 | 52 | 4 | N.W. | Columbia, R. | 34 | 50 | 120W | S.W. |
| Branco, C. | 47 | 10s | 40W | ■ | Carlisle | 16 | 55 | 3 | ■ | Coimbatore Gap | 66 | 10 | 75 | N.E. |
| Brazil | 52 | — | — | — | Carlow | 18 | 53 | 7 | ■ | Como, L. | 32 | 46 | 10 | W |
| Brazzaville | 54 | 0 | 10 | ■ | Carlsruhe | 30 | 50 | 8 | ■ | Comorin, C. | 66 | 10 | 75 | S.E. |
| Brecknock | 16 | 52 | 3 | W | Carnarthen | 16 | 52 | ■ | S.W. | Comoro Is. | 54 | 10s | 40 | E |
| Breen Beacons Mts. | 10 | 52 | 4 | — | Carnarvon | 16 | 53 | 4 | N.W. | Concepcion | 52 | 40 | 70 | N.W. |
| Bremen | 30 | 54 | 8 | S.E. | Carnsore Pt. | 10 | 52 | ■ | — | Congo R. | 47 | 0 | 20 | N |
| Bromerhaven | 30 | 54 | 8 | S.E. | Carpathian Mts. | 30 | 50 | 22 | ■ | Congo State | 54 | 0 | 20 | S.E. |
| Brenn | 30 | 54 | 8 | S.E. | Carpentaria | 59 | 15 | 140 | — | Coniston, L. | 10 | 54 | 4 | N.E. |
| Brenner Pass | 30 | 48 | 12 | S.W. | Cartara | 32 | 44 | 10 | ■ | Connaught | 18 | 54 | 9 | ■ |
| Brentford | 16 | inset | — | — | Cartagena S. Amer | 52 | 10N | 80 | E | Conneimara Mts. | 10 | 54 | 10 | S.E. |
| Brescia | 32 | 46 | 10 | S | Cartagena, S. Am. | 28 | 38 | 0 | S.W. | Connecticut | 43 | 40 | 75 | N.W. |
| Breslau | 30 | 52 | 16 | S.E. | Cartilage | 54 | 40 | 10E | ■ | Constance, L. | 30 | 48 | 10 | S.W. |
| Brest | 28 | 48 | 4W | N.W. | Cascade, Ra. | 63 | 50 | 130 | N.E. | Constantine | 54 | 4 | 10E | S.W. |
| Bridgetown | 68 | 15 | 60 | S.E. | Cashel, Ireland | 18 | 53 | 8 | S | Constantinople | 32 | 42 | 28 | S.E. |
| Briez Lake | 30 | 46 | 8 | N | Caspian Sea | 21 | 40 | 50 | N | Cook, Mt. | 59 | inset | — | — |
| Brighton | 16 | 51 | 0 | S | Cassol | 30 | 52 | 10 | S.W. | Cook Str. | 59 | inset | — | — |
| Brindisi | 32 | 40 | 18 | N | Catalonia | 28 | 42 | 2E | S | Cooktown | 59 | 15 | 145 | — |
| Brisbane | 59 | 25 | 155 | S.W. | Catania | 32 | 38 | 16 | S.W. | Coolgardie | 59 | 30 | 120 | S.E. |
| Bristol | 16 | 51 | 3 | N.E. | Catacract, Ist. | 47 | 20N | 30 | N.E. | Cooper, R. | 59 | 30 | 140 | N.W. |
| British Channel | 10 | 51½ | 4 | — | Caucasia | 23 | 40 | 40 | N.E. | Copenhagen | 23 | 60 | 10 | S.E. |
| British Columbia | 63 | 50 | 120 | N.W. | Caucasus Mts. | 21 | 40 | 50 | N.W. | Cordoba | 52 | 30 | 60 | S.W. |
| British East Africa | 61 | 0 | 40 | N.W. | Cauvery R. | 66 | 10 | 75 | N.E. | Cordova | 28 | 38 | 4W | W |
| British Guiana | 68 | 5 | 60 | ■ | Cavan | 18 | 54 | 7 | S.W. | Corea | 45 | 40 | 125 | S.E. |
| British Honduras | 68 | 15 | 85 | N.W. | Cawnpur | 66 | 25 | 80 | N | Corea Str. | 45 | 35 | 130 | S.W. |
| British Isles | 10 | etc. | — | — | Cayenne | 52 | 0 | 50 | N.W. | Corfu | 32 | 40 | 20 | S.W. |
| British New Guinea | 9 | 10s | 140E | ■ | Celebes, I. | 39 | 0 | 120 | ■ | Corinth | 32 | 38 | 22 | E |
| British Somaliland | 54 | 10N | 50 | W | Central America | 52 | — | — | — | Corinth, G. of | 32 | 38 | 22 | N.E. |
| Brittany | 28 | 48 | 2W | — | Cephalonia | 32 | 38 | 20 | N.E. | Cork | 18 | 52 | 8 | S.W. |
| Brocken, Mt. | 30 | 52 | 10 | S.E. | Cetinja | 32 | 42 | 18 | N.E. | Cornwall | 16 | 50 | 5 | N.E. |
| Brown Hill | 59 | 30 | 140 | S.E. | Ceuta | 54 | 40 | 10W | S.E. | Coromandel Coast | 66 | 10 | 80 | N |
| Bruges | 30 | 52 | 4 | S.W. | Cevennes Mts. | 28 | 44 | 4E | N | Corrib, L. | 10 | 54 | ■ | — |
| Brunel | 68 | 5 | 70 | S | Ceylon I. | 66 | 10 | 80 | S.E. | Corsica, I. | 28 | inset | — | — |
| Brunn | 30 | 50 | 16 | S.E. | Champlain L. | 43 | 45 | 75 | ■ | Coruña | 28 | 44 | 8W | S.W. |
| Brunswick | 30 | 52 | 10 | S.E. | Champagne | 28 | 48 | 4E | N | Costa Rica | 52 | 10N | 81 | W |
| Brussels | 30 | 50 | 4 | N.E. | Channel Is. | 10 | 50 | ■ | E | Cotopaxi, Mt. | 47 | 0 | 80 | E |
| Buchan Ness | 10 | 58 | 2 | ■ | Charles, C. | 63 | 50 | 60 | N.E. | Cotswold Hills | 10 | 51½ | 2 | N.W. |
| Bucharest | 32 | 44 | 26 | N | Charleston | 43 | 35 | 80 | ■ | Coventry | 16 | 52 | ■ | N.E. |
| Buckingham | 16 | 52 | 1W | S.E. | Charlottenburg | 30 | 52 | 14 | N.W. | Craew. | 30 | 50 | 20 | — |
| Buchup | 30 | 48 | 20 | S.W. | Charter's Towers | 59 | 20 | 145 | E | Cradle Mt. | 59 | 40 | 145 | ■ |
| Buenos Aires | 52 | 30 | 60 | S | Chatham | 16 | inset | — | — | Crete I. | 32 | 36 | 24 | S.E. |
| Buñab. | 43 | 45 | 80 | S.E. | Chatham I. | 6 | 50s | 180 | ■ | Creuzot, Le | 28 | 46 | 4E | N |
| Bucovina | 30 | 48 | 24 | E | Chelmsford | 16 | 52 | 0 | S.E. | Crowe | 16 | 53 | 2 | N.W. |
| Bulawayo | 61 | 20 | 30 | ■ | Cheltenham | 16 | 52 | ■ | S | Crimea | 21 | 50 | ■ | S.E. |
| Bulgaria | 32 | 42 | 26 | N | Cheluskia, C. | 34 | 80 | 110E | S | Cromarty | 18 | 58 | ■ | S |
| Burdekin, R. | 59 | 20 | 145 | N.E. | Chernitz | 30 | 50 | 12 | N.E. | Cromer | 16 | 53 | 1E | ■ |
| Burnley | 16 | 54 | 2 | S.W. | Chernulpe | 45 | 35 | 120 | N.E. | Cross Fell | 10 | 54 | 2 | ■ |
| Burgas | 32 | 42 | 28 | N.W. | Chenab, R. | 66 | 30 | 75 | N.W. | Croydon | 16 | inset | — | — |
| Burgundy | 28 | 48 | 4E | S.E. | Cherbourg | 28 | 50 | 2W | ■ | Cuba | 41 | 20 | ■ | N |
| Burma | 66 | 20 | 95 | S.E. | Cherwell, R. | 10 | 52 | 2 | N.E. | Cumberland | 16 | 55 | 3 | ■ |
| Burnley | 16 | 54 | 2 | S.W. | Chesapeake Bay | 43 | 40 | 75 | S.W. | Cumbrian | 16 | 54 | ■ | S.E. |
| Burton | 16 | 53 | 2 | S.E. | Cheshire, Co. | 16 | 53 | 3 | N.E. | Cunnamutta | 59 | 30 | 145 | ■ |
| Buru, C. | 34 | 0 | 100E | ■ | Chester | 16 | 53 | 3 | N | Curaçoa I. | 68 | 10 | 70 | N.E. |
| Bury | 16 | 54 | 2 | S.W. | Chesterfield | 16 | 53 | 1W | N.W. | Cuteh, G. of | 66 | 20 | 70 | N.W. |
| Bushire | 39 | 30 | 50 | S.E. | Chesiot Hills | 10 | 56 | 2 | S.W. | Cuttack | 66 | 25 | 85 | ■ |
| Bute | 18 | 56 | ■ | S.W. | Chicago | 43 | 40 | ■ | N.E. | Cuxhaven | 30 | 54 | 8 | S.E. |
| | | | | | | | | | | Cuzco | 52 | 10s | 70 | S.W. |

| | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing |
|-----------------------------|-------|-------|-------|---------|---|-------|-------|-------|---------|------------------------------|-------|------------|-------|---------|
| Cyclades, Is. | 32 | 38 | 24 | S.E. | East Anglian Ridge | 10 | 52 | ■ | ■ | French Congo | 54 | 0 | 10E | ■ |
| Cyprus I. | 21 | 40 | 30 | S.E. | East C., New Zealand. | 59 | inset | | | French Guinea | 52 | 10N | 50 | S.W. |
| DACCA | 66 | 25 | 90 | S.E. | East C., Siberia | 34 | 70 | 180 | ■ | French Guinea | 54 | 10N | 10W | N.W. |
| Dahomé | 54 | 10N | 0 | S.E. | East Ham | 16 | inset | | | Frison Is. | 30 | 54 | 6 | ■ |
| Dakar | 54 | 10N | 10W | N.W. | East London | 61 | 30 | 30 | S.W. | Fuchau | 45 | 25 | 120 | N.W. |
| Dakota, N. | 43 | 45 | 100 | N | Eastbourne | 16 | 51 | 0 | S.E. | Fujiyama, Mt. | 25 | 35 | 140 | S.W. |
| Dakota, S. | 43 | 45 | 100 | ■ | Eastern Rumelia | 32 | 42 | 26 | N | Fundy, Bay of | 63 | 40 | 70 | N.E. |
| Dal R. | 21 | 60 | 20 | W | Ebro, R. | 28 | 42 | 9 | S | Fusan | 45 | 35 | 190 | — |
| Dalgety | 59 | 35 | 150 | S.W. | Echuca | 59 | 35 | 145 | S | GAINSBOROUGH 16 | 53 | 1W | N.E. | |
| Dalny | 45 | 40 | 120 | S.E. | Ecuador | 52 | 0 | 80 | S.E. | Gairdner, L. | 59 | 30 | 135 | S.E. |
| Damascus | 39 | 30 | 50 | N.W. | Edon, R. | 10 | 54 | 4 | N.E. | Galapagos Is. | 47 | 0 | 90 | — |
| Damietta | 54 | inset | | | Edge Hill | 10 | 52 | ■ | — | Galatz | 32 | 46 | 28 | S |
| Danube, R. | 30 | 46 | 18 | E | Edinburgh | 18 | 56 | 3 | S.W. | Galicin, Austria | 30 | 50 | 22 | S |
| Danzig | 30 | 54 | 18 | N.E. | Edmonton | 63 | 50 | 110 | N.W. | Galicin, Spain | 28 | 42 | 8W | N |
| Dar es Salaam | 54 | 10s | 40 | N | Egmont, Mt. | 59 | inset | | | Galle | 66 | 5 | 80 | N |
| Darfur | 54 | 10N | 20 | N.E. | Egypt | 54 | inset | | | Galloway, Mull of | 10 | 54 | 4 | N.W. |
| Dardanelles | 32 | 40 | 26 | — | Egyptian Sudan | 54 | 10N | 30 | N | Galty Mts. | 10 | 52 | 8 | — |
| Darien, G. of | 47 | 10N | 80 | E | El Fayum | 54 | inset | | | Galveston | 43 | 30 | 95 | S |
| Darjiling | 66 | 25 | 90 | N.W. | Elba, I. | 32 | 42 | 10 | N | Galway | 18 | 53 | ■ | N |
| Darling Downs | 59 | 30 | 150 | N | Elbe, R. | 30 | 54 | 10 | S.E. | Gambia R. | 47 | 10N | 10W | N.W. |
| Darling R. | 59 | 30 | 145 | S.W. | Elberfeld | 30 | 52 | 8 | S.W. | Gambia | 61 | inset | | |
| Darlington | 16 | 55 | 2 | S.W. | Elbruz, Mt. | 21 | 40 | 40 | N.E. | Ganges, R. | 66 | 25 | ■ | W |
| Darmstadt | 30 | 50 | 8 | ■ | Elburz, Mts. | 34 | 40 | 50E | S.E. | Garda, L. | 32 | 46 | 10 | S.E. |
| Dartmoor | 10 | 50 | 4 | N | Elgin | 18 | 58 | 3 | S.W. | Garonne, R. | 28 | 44 | ■ | N |
| Davis Str. | 63 | 70 | 60 | ■ | Elkon, Mt. | 61 | 0 | 35 | N.W. | Gascony | 28 | 44 | 0 | ■ |
| Dawson | 63 | 60 | 140 | N | Ely, Isle of | 16 | 52 | 0 | N.E. | Gateshead | 16 | 55 | 2 | E |
| Deccan | 66 | 20 | 80 | S.W. | Emilia | 32 | 44 | 10 | N.E. | Ghats, Eastern | 66 | 15 | 80 | S.W. |
| Dee, R., Scotland | 10 | 58 | 2 | S | Enns, R. | 30 | 52 | 8 | N.W. | Ghats, Western | 66 | 15 | 75 | N.W. |
| Dee, R., Wales | 10 | 54 | 4 | S.E. | Enderby Land | 6 | 66s | 50E | — | Geelong | 59 | 40 | 145 | N.W. |
| Delagoa Bay | 61 | 25 | 35 | S.W. | English Chan. | 21 | 0 | 50 | W | Geneva | 30 | 46 | ■ | N |
| Delaware Bay | 43 | 40 | 75 | S | Enniskillen | 18 | 54 | E | N.E. | Geneva, L. | 30 | 46 | 6 | N |
| Delaware | 43 | 40 | 75 | S | Epirus | 32 | 40 | 20 | S.E. | Genoa | 32 | 44 | 8 | S.E. |
| Delhi | 66 | 30 | 75 | S.E. | Erasmus, Mt. | 6 | 80s | 170E | — | Genoa, G. of | 32 | 44 | 8 | ■ |
| Demavend, Mt. | 34 | 40 | 50E | S | Erfurt | 30 | 52 | 12 | S.W. | Georgetown | 63 | 5 | 60 | N.E. |
| Demblitz | 16 | 53 | 3 | N.W. | Erie, L. | 34 | 40 | 80W | N | Georgia | 43 | 35 | 85 | S.E. |
| Denmark | 23 | 60 | 10 | ■ | Eritrea | 54 | 20N | 40 | S | Georgia South, I. | 6 | 50s | 40W | S.E. |
| Denver | 43 | 40 | 105 | — | Erno, L. | 10 | 54 | 8 | N | Geraldton | 59 | 30 | 115 | N |
| Derby | 16 | 53 | 2 | ■ | Erne, R. | 10 | 54 | 8 | N | German E. Africa | 54 | 10s | 40 | N.W. |
| Derg, L. | 10 | 52 | 8N | — | Erz Gebirge | 30 | 50 | 14 | N.W. | German New Guinea | 8 | 0 | 140E | ■ |
| Derwent, R. | 10 | 54 | 0 | W | Erzerum | 39 | 40 | 40 | — | Germany | 30 | — | — | — |
| Derwent, R. | 10 | 54 | 2 | S | Esquimalt | 63 | 50 | 120 | S.W. | Ghent | 30 | 52 | 4 | S |
| Derwent, R. | 10 | 54 | 4 | N | Essen | 30 | 52 | 8 | S.W. | Giant Mts. | 30 | 50 | 16 | N |
| Detroit | 43 | 45 | 85 | S.E. | Essequibo R. | 68 | 5 | 60 | E | Giants' Causeway | 10 | 56 | 6 | S.W. |
| Devon | 16 | 50 | 4 | ■ | Essex | 16 | 51 | 0 | S.E. | Gibraltar | 28 | 36 | 8W | ■ |
| Devonport | 16 | 50 | 4 | ■ | Estremadura | 28 | 40 | 6W | S | Gibraltar, Str. of | 28 | 36 | 6W | ■ |
| Dewsbury | 16 | 54 | 2 | S.E. | Eubœa I. | 32 | 38 | 24 | N | Gijon | 28 | 44 | 6W | ■ |
| Dhulagiri, Mt. | 66 | 30 | 85 | S | Euphrates, R. | 34 | 30 | 40E | N.E. | Gilbert Is. | 8 | 0 | 170E | — |
| Diego Suarez | 54 | 10s | 50 | S.W. | Everest, Mt. | 34 | 30 | 90E | — | Gippsland | 59 | 40 | 150 | N.W. |
| Dieppe | 28 | 50 | 2E | W | Eze R. | 10 | 51½ | 4 | S.E. | Gironde, R. | 28 | 46 | 2W | S.E. |
| Dijon | 28 | 48 | 4E | S.E. | Exeter | 16 | 51 | 4 | S.E. | Glamorgan | 16 | 52 | 4 | S.E. |
| Dinaric Alps | 30 | 44 | 16 | E | Exmoor | 10 | 51½ | 4 | S | Glasgow | 18 | 56 | 4 | S.W. |
| Dnieper R. | 21 | 50 | 30 | S.E. | Eyre, L. | 59 | 30 | 135 | N.E. | Glengyle | 13 | (rainfall) | | |
| Dniester, R. | 21 | 50 | 30 | S.W. | FALKLAND IS. | 6 | 50s | 50E | — | Glommen R. | 21 | 60 | 10 | N.E. |
| Dolmely | 16 | 53 | 4 | S | Falmouth | 16 | 50 | 5 | N | Gloucester | 16 | 52 | 2 | S.W. |
| Dominica, I. | 68 | 15 | 60 | N.W. | Farwell, C., Greenland | 34 | 60 | 40W | W | Goa | 66 | 15 | 75 | N.W. |
| Don, R., England | 10 | 54 | 2 | S.E. | Farwell, C., New Zea-
land | 59 | inset | | | Goat Fell | 10 | 56 | ■ | S.E. |
| Don, R., Russia | 21 | 50 | 40 | E | Faroe Is. | 23 | 60 | 10W | N.E. | Gobi Desert | 34 | 40 | 100E | S.E. |
| Don, R., Scotland | 10 | 58 | 2 | ■ | Fashoda | 54 | 5N | 30 | E | Godavari, R. | 66 | 20 | 80 | S.W. |
| Doncaster | 16 | 54 | 1W | S | Fermanagh | 18 | 54 | 8 | N.E. | Godwin Austen, Mt. | 66 | 35 | 75 | S.E. |
| Dondra Hd. | 66 | 5 | 80 | N | Fernando Po., I. | 54 | 0 | 10E | N.W. | Gogra R. | 66 | 25 | 85 | N.W. |
| Donegal Bay | 10 | 54 | 8 | — | Ferrol | 28 | 44 | 8W | S.W. | Gold Coast | 61 | inset | | |
| Donegal | 18 | 55 | 8 | S | Fez | 54 | 30N | 0 | N.W. | Golkonda Coast | 66 | 15 | 85 | N.W. |
| Dongola | 54 | 20N | 30 | S.E. | Fezzan | 54 | 20N | 20E | N.W. | Gomul Pass | 66 | 30 | 70 | N.W. |
| Dordogne, R. | 28 | 46 | 0 | S | Fife | 18 | 56 | 3 | N.W. | Good Hope, C. of | 61 | 30 | 20 | S |
| Doré, Mt. | 28 | 46 | 2E | S.E. | Fiji Is. | 8 | 20s | 180E | — | Goodwick | 16 | 52 | ■ | — |
| Dorpat | 23 | 60 | 30 | S.W. | Findhorn, R. | 10 | 58 | 4 | ■ | Goole | 16 | 54 | 1E | S.E. |
| Dorset | 16 | 51 | 2 | S.W. | Finisterre, C. | 28 | 42 | 8W | N.W. | Göta R. | 21 | 60 | 10 | S.E. |
| Dortmund | 30 | 52 | 8 | S.W. | Finland | 23 | 60 | 30 | N.W. | Göteborg | 23 | 60 | 10 | S.E. |
| Doubs, R. | 28 | 48 | 6E | ■ | Finland, G. of | 21 | 60 | 30 | W | Götland | 21 | 60 | 20 | S |
| Douglas | 16 | 54 | 4 | N.W. | Fitzroy, R. | 59 | 25 | 159 | N.W. | Goulburn | 59 | 35 | 150 | N.W. |
| Douro, R. | 28 | 42 | 8W | S | Fiume | 30 | 46 | 14 | ■ | Grafton | 59 | 30 | 150 | E |
| Dover | 16 | 51 | 1E | N.E. | Flinders | 59 | 20 | 125 | N | Graham Land | 6 | 70s | 60W | — |
| Dover, Straits of | 10 | 51½ | 0 | S.E. | Flinders Range | 59 | 30 | 140 | S.W. | Grahamstown | 61 | 30 | 25 | S.E. |
| Dowra | 18 | 54 | 6 | N | Flint | 16 | 53 | 3 | N | Grampians, Mts. | 10 | 56 | 4 | — |
| Dowpatrick | 18 | 54 | 6 | N.E. | Florence | 32 | 44 | 12 | S.W. | Gran Chaco | 47 | 20s | 60 | S |
| Drakensberg | 61 | 30 | 30 | N.W. | Florida | 43 | 30 | 80 | S.W. | Granada | 28 | 38 | 4W | S.E. |
| Drave, R. | 30 | 46 | 18 | S.E. | Florida, Str. | 34 | 30 | 80W | S | Grantham | 16 | 53 | 1W | S.E. |
| Dresden | 30 | 52 | 14 | S | Flushing | 30 | 52 | 4 | S.W. | Gravesend | 16 | inset | | |
| Dublin | 18 | 53 | 6 | N.W. | Folkstone | 16 | 51 | 1E | N.E. | Graz | 30 | 48 | 16 | S.W. |
| Dudley | 16 | 53 | 2 | ■ | Forfar | 18 | 57 | 3 | S | Great Bear | 63 | 70 | 120 | S |
| Duluth | 43 | 45 | 95 | N.E. | Formosa, I. | | | | | | | | | |

| | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing | | Plate | Lat. | Long. | Bearing |
|--------------------------------|----------|------|-------|---------|----------------------------------|----------|------|-------|---------|--------------------------------|----------|------|-------|---------|
| Guatemala | 52 | 20N | 90 | S | Innsbruck | 30 | 48 | 12 | S.W | Kilkenny | 18 | 52 | 7 | N |
| Guayacul | 52 | 0 | 80 | S | Invercargill | 59 inset | | | | Killarney, L. | 10 | 52 | 10 | E |
| Guernsey | 28 | 50 | 2W | S.W | Inverness | 18 | 57 | 4 | N.W | Kilmarnock | 18 | 56 | 5 | S.E |
| Guiana | 52 | 10N | 60 | S.E | Ionian Is. | 21 | 40 | 20 | — | Kilung | 45 | 25 | 120 | E |
| Guineane | 28 | 44 | 0 | S.W | Ionian Sea | 32 | 38 | 18 | — | Kimberley, Australia | 61 | 30 | 25 | W |
| Gulldford | 16 | 51 | 0 | N.W | Iowa | 43 | 40 | 95 | N | Kimberley, Africa | 59 | 15 | 125 | — |
| Guinea, French | 54 | 10N | 10W | N.W | Ipewich | 16 | 52 | 1E | — | Kincardine | 18 | 57 | 3 | — |
| Guinea, G. of | 47 | 0 | 0 | N | Ipewich, Queensland | 59 | 25 | 155 | S.W | King George's Sd. | 59 | 35 | 120 | W |
| Gwalior | 68 | 25 | 80 | N.W | Iquique | 52 | 20S | 70 | — | King Edward VII Land | 6 | 80S | 150W | — |
| Gympie | 50 | 25 | 155 | S.W | Iran | 34 | 30 | 50E | N.E | King William's Tn. | 61 | 30 | 25 | — |
| HAARIEM | 30 | 52 | — | N.E | Irawadi | 66 | 20 | 95 | — | King's Co. | 18 | 53 | 8 | N.E |
| Haddington | 18 | 56 | — | E.E | Ireland | 18 | — | — | — | Kingston, Canada | 63 | 50 | 80 | S.E |
| Haddington | 18 | 56 | 3 | S.E | Irish Sea | 10 | 54 | 4 | W | Kingston, Jamaica | 68 | 15 | 75 | N.W |
| Hague, C. de la | 28 | 50 | 2W | S | Irkutsk | 39 | 50 | 100 | N.E | Kingsdown | 18 | 53 | — | N |
| Hague, The | 50 | 52 | 4 | — | Irtish, R. | 34 | 50 | 80E | N.W | Kinross | 18 | 56 | 3 | N.W |
| Haidarabad, Deccan | 66 | 15 | 80 | N.W | Isère R. | 28 | 46 | 6E | S | Kinsale, Old Head of | 10 | 51½ | 8 | — |
| Haidarabad, Sind. | 60 | 25 | 70 | W | Islay, I. | 10 | 56 | 6 | S | Kioto | 45 | 35 | 135 | — |
| Haiti | 20 | 70 | — | S.W | Ismaïlia | 54 inset | | | | Kirkcudbright | 18 | 55 | — | — |
| Halle | 30 | 52 | 12 | — | Ispahan | 39 | 30 | 50 | N.E | Kirkwall | 18 | 59 | — | — |
| Hai-nan, I. | 45 | 20 | 110 | — | Italian Somaliland | 54 | 10N | 50 | S.W | Kishinef | 23 | 50 | 30 | W |
| Hakodadi | 45 | 40 | 140 | N | Italy | 52 | — | — | — | Kistna, R. | 66 | 15 | 80 | N.W |
| Halifax, Nova Scotia | 63 | 40 | 60 | N.W | Ivica, I. | 28 | 38 | 2E | N.W | Kiu-shiu I. | 45 | 30 | 130 | N.E |
| Halifax, England | 16 | 54 | 2 | — | Ivory Coast | 54 | 10N | 10W | S.E | Kivu, L. | 61 | 0 | 30 | S.W |
| Hamburg | 30 | 54 | 10 | — | JABALPUR | 66 | 25 | 80 | — | Klondike | 63 | 60 | 140 | N.E |
| Hamilton | 63 | 50 | 80 | — | Jaipur | 66 | 25 | 75 | N.E | Kobe | 45 | 35 | 135 | — |
| Hammerfest | 23 | 70 | 20 | N.E | Jamaica, I. | 68 | 20 | 75 | S.W | Kohlapur | 66 | 15 | 75 | N.W |
| Hampshire | 16 | 51 | 1W | N | Japan, Sea of | 34 | 40 | 130E | — | Konakry | 54 | 10N | 10W | — |
| Hang-chau | 45 | 30 | 120 | — | Japan | 45 | — | — | — | Königsberg | 30 | 54 | 20 | W |
| Han-kau | 45 | 30 | 115 | N | Jassy | 32 | 46 | 28 | W | Kordofan | 54 | 10N | 30 | N |
| Hanley | 16 | 53 | 2 | W | Java, I. | 39 | 10 | 110 | W | Kosciusko, Mt. | 59 | 35 | 150 | S |
| Hanoi | 20 | 110 | — | W | Jehlam, R. | 66 | 30 | 75 | N.W | Kra, Isth. of | 68 | 10 | 100 | W |
| Hanover | 30 | 52 | 10 | N.W | Jerez | 28 | 36 | 6W | N | Krefeld | 30 | 52 | — | S.E |
| Harbin | 45 | 45 | 125 | N.E | Jersey, I. | 10 | 50 | 2W | S.W | Kronstadt | 23 | 60 | 30 | — |
| Harris | 10 | 58 | 8 | S.E | Jerusalem | 39 | 30 | 40 | N.W | Kuala Lumpur | 08 | 5 | 100 | W |
| Hartlepool | 16 | 55 | 1W | — | Jibuti | 54 | 10N | 40 | N.E | Kuching | 68 | 5 | 110 | S.E |
| Harwich | 16 | 52 | 1E | S.E | Jोधपुर | 66 | 25 | 75 | N.W | Kuka | 61 inset | | | |
| Harz Mts. | 30 | 52 | 10 | — | Johannesburg | 61 | 25 | 30 | S.W | Kumasi | 61 inset | | | |
| Hastings | 16 | 51 | 1E | S.W | Jub R. | 47 | 0 | 40 | N.E | Kunene, R. | 61 | 15 | 15 | N.W |
| Hatteras, C. | 34 | 40 | 70W | S.W | Jumna, R. | 66 | 25 | 80 | N | Kurile Is. | 34 | 50 | 150E | S |
| Hauraki, G. | 59 inset | | | | Jungfrau, Mt. | 30 | 46 | 8 | N | Kustenje | 32 | 44 | 28 | — |
| Havana | 41 | 20 | 80 | N.W | Jura Mts. | 30 | 48 | 6 | S.E | Kwang-chau | 45 | 20 | 110 | N.E |
| Havre | 28 | 50 | 0 | — | Jutland | 21 | 60 | 10 | S | Kwanza, R. | 47 | 10S | 20E | W |
| Hawaii, Is. | 8 | 20N | 160W | — | KABUL | 66 | 35 | 70 | W | Kwen Lun, Mts. | 34 | 40 | 90E | S.W |
| Hawke B. | 59 inset | | | | Kabul R. | 66 | 35 | 70 | — | LA GUAYRA | 52 | 10N | 70 | N.E |
| Hawkesbury R. | 59 | 35 | 150 | N.E | Kaien I. | 63 | 50 | 120 | W | La Paz | 52 | 20S | 70 | N.E |
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| Old Castile | 28 | 42 | 2W | — | Pietermaritzburg | 61 | 30 | 30 | — | Riga | 23 | 60 | 20 | S.E |
| Oldham | 16 | 54 | 2 | S | Pilsen | 30 | 50 | 14 | S.W | Riga, G. of | 21 | 60 | 20 | S.E |
| Olympus, Mt. | 32 | 40 | 22 | E | Pindus, Mt. | 32 | 40 | 22 | W | Rio de Janeiro | 52 | 20S | 40 | S.W |
| Omaha | 43 | 40 | 95 | N.W | Pine Creek | 59 | 15 | 130 | N.E | Rio de la Plata | 47 | 30S | 60 | S.E |
| Oman | 39 | 20 | 60 | N.W | Piræus | 32 | 38 | 24 | — | Rio de Oro | 54 | 20N | 10W | N.W |
| Omdurman | 54 | 20N | 30 | S.E | Pisa | 32 | 44 | 10 | S.E | Rio Grande del Norte | 34 | 30 | 100W | — |
| Omsk | 39 | 50 | 70 | N.E | Pittsburg | 43 | 40 | 80 | N | Ripon | 16 | 54 | 2 | N.E |
| Omega, L. | 21 | 60 | 40 | N.W | Platte, R. | 34 | 40 | 100W | N.W | Riverina | 59 | 30 | 145 | S |
| Ontario, L. | 43 | 45 | 80 | S.E | Platten | 30 | 48 | 18 | S | Riviera | 28 | 44 | 6E | S.E |
| Ontario | 63 | 50 | 80 | S.W | Plymouth | 16 | 50 | 4 | N | Roca, C. da | 28 | 38 | 8W | N.W |
| Oodnadatta | 59 | 25 | 135 | S | Plynlimmon, Mt. | 10 | 52 | 4 | N | Rochdale | 16 | 54 | 2 | S |
| Oporto | 28 | 42 | 8W | S.W | Po, R. | 32 | 40 | 12 | N | Rochelle | 26 | 46 | 2W | N.E |
| Oran | 54 | 40 | 0 | S | Poitiers | 28 | 46 | 0 | N | Rochester, England | 16 | inset | | |
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| Orange | 59 | 35 | 150 | N.W | Poland | 23 | 50 | 20 | N | Rockhampton | 59 | 25 | 150 | N.E |
| Ore Mts. | 30 | 50 | 12 | N.E | Polar Regions | 6 | — | — | — | Rocky Mts. | 34 | 50 | 110W | W |
| Oregon | 43 | 45 | 120 | S | Pondicherri | 66 | 10 | 80 | N | Rome | 32 | 42 | 12 | S.E |
| Orenburg | 23 | 50 | 60 | N.W | Pondoland | 61 | 30 | 30 | S.W | Roraima, Mt. | 47 | 10N | 60 | S |
| Orinoco R. | 47 | 10N | 60 | S.W | Poole | 16 | 51 | 2 | S | Rosario | 52 | 30 | 60 | S.W |
| Orizaba Mt. | 34 | 20 | 100W | E | Poona | 60 | 20 | 75 | S.W | Roscommon | 18 | 54 | 8 | S.W |
| Orkney Is. | 18 | 59 | 3 | — | Portland Bill | 10 | 50 | 2 | N.W | Rosetta | 54 | inset | | |
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| Orsova | 30 | 44 | 22 | N.E | Portland, Oregon | 43 | 45 | 125 | E | Rosslare | 18 | 52 | 6 | N.W |
| Ortegal, C. | 28 | 44 | 8W | — | Portland, Maine | 43 | 45 | 70 | S | Rostof | 23 | 50 | 40 | S |
| Ostende | 30 | 52 | 4 | S.W | Port Arthur, Canada | 63 | 50 | 90 | S | Rotterdam | 30 | 52 | 4 | E |
| Otranto, Str. of | 32 | 40 | 18 | N.E | Port Arthur, China | 45 | 40 | 120 | S.E | Roubair | 28 | 50 | 4E | N.W |
| Ottawa | 63 | 50 | 80 | S.E | Port au Prince | 52 | 20N | 70 | S.W | Rouen | 28 | 50 | 2E | N.W |
| Ouro Preto | 52 | 20S | 40 | S.W | Port au Spain | 68 | 10 | 60 | N.W | Rovuma R. | 61 | 10 | 40 | S.W |
| Ouse, R. | 10 | 54 | 0 | S.W | Port Augusta | 59 | 30 | 140 | S.W | Roxburgh | 18 | 55 | 3 | N.E |
| Ouse, Gt. R. | 10 | 52 | 0 | N | Port Darwin | 59 | 15 | 130 | N | Ruapehu, Mt. | 59 | inset | | |
| Oviedo | 28 | 44 | 6W | S | Port Elizabeth | 61 | 30 | 15 | S | Rudolf, L. | 61 | 5N | 35 | S.E |
| Oxford | 16 | 52 | 1W | S.W | Port Florence | 61 | 0 | 35 | — | Rugby | 16 | 52 | 1W | N |
| Ozaka | 45 | 35 | 135 | S.E | Port Jackson | 59 | 35 | 150 | N.E | Rugen, I. | 30 | 54 | 14 | N.W |
| PADANG | 39 | 0 | 100 | — | Port Nolloth | 61 | 30 | 15 | E | Ruhr R. | 30 | 52 | 8 | S |
| Padua | 32 | 46 | 12 | S.W | Port Pirie | 59 | 35 | 140 | N.W | Rumania | 32 | 44 | 26 | N |
| Pailang | 68 | 5 | 100 | S.E | Port Phillip | 59 | 40 | 145 | N | Ruschuk | 32 | 44 | 26 | — |
| Paisley | 18 | 56 | 4 | S.W | Port Said | 54 | inset | | — | Russia | 23 | — | — | — |
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| Palermo | 32 | 38 | 14 | N.W | Porto Alegre | 52 | 30 | 50 | — | Ruvenzori, Mt. | 47 | 0 | 30 | W |
| Palk Str. | 66 | 10 | 80 | — | Porto Cabella | 52 | 10N | 70 | N.E | SABLE, C. | 63 | 40 | 60 | N.W |
| Palma | 28 | 40 | 2E | S.E | Porto Rico, I. | 52 | 20N | 70 | S.E | Saguena R. | 63 | 50 | 70 | S.W |
| Palmas, C. | 47 | 0 | 0 | N.W | Portsmouth | 16 | 51 | 1W | S | Sahara | 47 | 20N | — | N |
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| Pamirs, Plat. | 34 | 40 | 70E | S.E | Posen | 30 | 52 | 16 | N.E | St. Albans | 16 | 52 | 0 | S |
| Pampas | 47 | 40 | 60 | N | Potsdam | 30 | 52 | 12 | N.E | St. Bernard Pass | 32 | 46 | 8 | S.W |
| Panama, Isth. of | 34 | 10 | 80W | — | Prague | 30 | 50 | 14 | — | St. David's Hd. | 10 | 52 | 6 | E |
| Pantallaria I. | 32 | 36 | 12 | N | Pr. Edward I. | 63 | 50 | 60 | S.W | St. Elias, Mt. | 34 | 60 | 140W | — |
| Pana | 52 | 0 | 50 | S.E | Pressburg | 30 | 48 | 18 | N.W | St. Etienne | 28 | 46 | 4E | — |
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| Paramaribo | 52 | 10N | 50 | S.W | Pretoria | 61 | 25 | 30 | S.W | St. Gothard Pass | 30 | 46 | 8 | N.E |
| Parana, R. | 47 | 30S | 60 | — | Prince Rupert | 63 | 50 | 130 | N | St. Helena, L. | 8 | 20S | 0 | N.W |
| Paríña, C. | 47 | 0 | 80 | S.W | Provence | 28 | 44 | 6E | — | St. Helena | 16 | 53 | 3 | N |
| Paris | 28 | 48 | 2E | N | Providence | 43 | 40 | 70 | N.W | St. John | 63 | 40 | 70 | N.E |
| Parma | 32 | 44 | 10 | N | Prussia | 30 | — | — | — | St. John's | 63 | 50 | 50 | S.W |
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| St. Petersburg | 23 | 60 | 30 | — | Sierra Morena | 28 | 38 | 4W | N | Sussex | 16 | 51 | 0 | N.W. |
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| Guinea | 54 | 0 | 10E | W | Sierra Nevada, United States | 34 | 40 | 120W | S | Sutlej, R. | 66 | 30 | 75 | N |
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| San Francisco R. | 47 | 10S | 40W | S.W. | Snowdon, Mt. | 10 | 52 | 4 | N | Tamatave | 54 | 20S | 50 | N.W. |
| San Marino | 32 | 44 | 12 | E | Sobat R. | 47 | 10N | 30 | S.E. | Tampico | 41 | 20 | 100 | N.W. |
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| Scheldt, R. | 30 | 52 | 4 | S | South Uist | 10 | 56 | 8 | N.W. | Tennessee | 43 | 35 | 85 | N.W. |
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| Tunbridge Wells | 16 | 51 | 0 | ■ | Vladivostok | 45 | 45 | 130 | S.E | Windhoek | 54 | 20s | 20 | S.W |
| Tunis | 54 | 40 | 10E | S | Volga R. | 21 | 60 | 50 | W | Windsor | 16 | 51 | 1W | N.E |
| Turin | 32 | 46 | 8 | ■ | Volta, R. | 61 | inset | — | — | Windward Is. | 68 | 15 | 60W | S.W |
| Turkestan E. | 39 | 40 | 90 | — | Vorarlberg | 30 | 48 | 10 | ■ | Winnipegosis, L. | 63 | 50 | 100 | N |
| Turkey | 32 | — | — | — | Vosges, Mts. | 28 | 48 | 5E | ■ | Winnipeg | 63 | 50 | 100 | ■ |
| Tuscany | 32 | 44 | 12 | S.W | WADAI | 54 | 5N | 20 | N | Winton | 59 | 20 | 145 | S.W |
| Tweed R. | 10 | 56 | 2 | ■ | Wadi Halfa | 54 | 20N | 30 | N | Wisconsin | 43 | 45 | ■ | — |
| Tyne, R. | 10 | 56 | 2 | S | Waikato, R. | 59 | inset | — | — | Witham, R. | 10 | 52 | ■ | ■ |
| Tynemouth | 16 | 55 | 1W | ■ | Wakatipu, L. | 59 | inset | — | — | Witwatersrand | 61 | 25 | 20 | S.E |
| Tyrol | 30 | 46 | 12 | N.W | Wakefield | 16 | 54 | 1W | S.W | Wolverhampton | 16 | 53 | ■ | S.W |
| Tyrene | 18 | 55 | 7 | ■ | Walachia | 32 | 44 | 24 | N.E | Woolwich | 16 | inset | — | — |
| Tyrrhenian Sea | 32 | 40 | 12 | — | Walsall | 16 | 53 | 2 | S | Worcester | 16 | 52 | 2 | N.W |
| UBANGI R. | 47 | 0 | 20 | N.W | Walthamstow | 16 | inset | — | — | Workington | 16 | 55 | ■ | ■ |
| Ucayali, R. | 47 | 10s | 70 | W | Walvisch Bay | 61 | 25 | 15 | ■ | Wrath, C. | 10 | 58 | 6 | N.E |
| Udaipur | 66 | 25 | 75 | S.W | Wanganui, R. | 59 | inset | — | — | Wrekin, Mt. | 10 | 52 | 2 | N.W |
| Uganda | 54 | 0 | 30 | N.E | Warrington | 16 | 53 | 3 | N.E | Wu-chang | 45 | 30 | 115 | — |
| Ulm | 30 | 46 | 10 | N | Warsaw | 23 | 50 | 20 | N.E | Wu-chau | 45 | 25 | 110 | S.E |
| Ulster | 18 | 55 | 7 | ■ | Warwick | 16 | 52 | 2 | N.E | Würtemberg | 30 | 48 | 10 | ■ |
| Umbria | 32 | 42 | 14 | N.E | Wash, The | 10 | 52 | ■ | N | Wye, R. | 10 | 52 | 2 | W |
| Ungava | 63 | 60 | 70 | ■ | Washington | 43 | 40 | 75 | S.W | Wyoming | 43 | 45 | 105 | S.W |
| United States | 43 | — | — | — | Washington | 43 | 45 | 120 | N | XINGU R. | 47 | 10s | 70 | N.W |
| Upala | 23 | 60 | 20 | W | Waterford | 18 | 52 | 7 | N.W | YABLONOI MTS. | 34 | 60 | 110 | ■ |
| Ural Mts. | 21 | 60 | 60 | — | Weald, The | 10 | 51½ | ■ | S | Yakoba | 61 | inset | — | — |
| Ural, R. | 21 | 50 | 50 | ■ | Weaver R. | 10 | 52 | 4 | S.W | Yakutsk | 39 | 60 | 120 | N.E |
| Uruguay, R. | 47 | 30s | 60 | E | Wednesbury | 16 | 53 | 2 | ■ | Yang-tse-kiang, R. | 34 | 30 | 110 | — |
| Uruguay | 52 | 30s | 60 | S.E | Wei-hai-wei | 45 | 35 | 20 | N.E | Yarkand | 39 | 40 | 80 | S.E |
| Ushant, I. | 28 | 48 | 4W | N.W | Wei-ho, R. | 45 | 35 | 110 | W | Yarmouth | 16 | 52 | 2 | S.W |
| Usk, R. | 10 | 51½ | 4 | ■ | Welland R. | 10 | 52 | 0 | N.W | Yekaterinburg | 23 | 60 | 60 | ■ |
| Utah | 43 | 40 | 110 | — | Wellington | 59 | inset | — | — | Yekaterinoslaf | 23 | 50 | 40 | S.W |
| Utrecht | 30 | 52 | 6 | N.W | Wells | 16 | 51 | ■ | N.E | Yellow Sea | 34 | 40 | 120 | S.E |
| VAAL R. | 61 | 25 | 25 | S | Welshpool | 16 | 53 | 3 | S.W | Yellowstone Park | 43 | 45 | 110 | — |
| Valdai Hills | 21 | 60 | 30 | S.E | Wener, L. | 21 | 60 | 10 | S.E | Yenesei, R. | 34 | 60 | 90 | — |
| Valdivia | 52 | 40 | 70 | W | Wentworth | 59 | 35 | 140 | N.E | Yezo, I. | 45 | 45 | 145 | S.W |
| Valencia, Spain | 28 | 40 | 0 | ■ | Weser | 30 | 52 | 8 | N.E | Yokohama | 45 | 35 | 140 | — |
| Valencia, S. Am. | 52 | 10N | 70 | E | West Australia | 59 | — | — | — | York, Canada | 63 | 60 | 90 | S.W |
| Valetta | 32 | 36 | 14 | ■ | West Bromwich | 16 | 53 | 2 | ■ | York, England | 16 | 54 | 1W | ■ |
| Valladolid | 28 | 42 | 4W | S.W | West C. | 59 | inset | — | — | York, C. | 59 | 15 | 145 | N.W |
| Valparaiso | 52 | 30 | 70 | S.W | Western Downs | 10 | 51½ | 2 | S | York Moors | 10 | 54 | 2 | N.E |
| Vancouver | 63 | 50 | 120 | W | West Ham | 16 | inset | — | — | York Wolds | 10 | 54 | 0 | W |
| Vancouver I. | 63 | 50 | 130 | E | West Indies | 68 | — | — | — | Yucatan | 34 | 20 | 90W | — |
| Vardar, R. | 32 | 42 | 22 | ■ | Westmeath | 18 | 53 | 7 | N.W | Yukon | 63 | 60 | 130 | N.W |
| Varna | 32 | 44 | 28 | ■ | Westminster | 16 | inset | — | — | Yukon R. | 34 | 60 | 150W | W |
| Vendée | 28 | 46 | 2W | N.E | Westmorland | 16 | 55 | 3 | ■ | Yunnan | 45 | 25 | 105 | ■ |
| Venetia | 32 | 46 | 12 | — | Westport | 59 | inset | — | — | ZAMBESI, R. | 61 | 15 | 30 | E |
| Venezuela | 52 | 10N | 70 | S.E | Wetter, L. | 21 | 60 | 10 | S.E | Zante, I. | 32 | 38 | 20 | E |
| Venice | 32 | 46 | 12 | S.E | Wexford | 18 | 52 | 7 | N.E | Zanzibar, I. | 61 | 5N | 40 | S |
| Vera Cruz | 41 | 20 | 100 | E | Weymouth | 16 | 51 | 2 | S.W | Zealand, I. | 21 | 60 | 10 | ■ |
| Verde, C. | 47 | 20N | 20W | S.E | Wharfe, R. | 10 | 54 | 2 | — | Zomba | 61 | 15 | 35 | — |
| Vermont | 43 | 45 | 70 | S.W | Whitehorse Hills | 10 | 51½ | 2 | — | Zuider Zee | 30 | 52 | 6 | N.W |
| Verona | 32 | 46 | 12 | ■ | White Mts. | 43 | 45 | 70 | S.W | Zululand | 61 | 30 | ■ | N.E |
| Versailles | 28 | 48 | 2E | ■ | White Sea | 21 | 70 | 40 | ■ | Zungevu | 61 | inset | — | — |
| Verviers | 30 | 50 | 6 | N | Whitehaven | 16 | 55 | 4 | S.E | Zurich | 30 | 48 | ■ | N.E |
| Vesuvius, Mt. | ■ | 40 | 14 | N.E | Whitney | 34 | 30 | 120W | N | | | | | |

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